Privation and the principles of natural substance in Aristotle's *Physics I*

Inaugural-Dissertation

zur Erlangung des Doktorgrades der Philosophie

der Ludwig-Maximilians-Universität

München

vorgelegt von

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Rom (Italien)

2021

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Tag der mündlichen Prüfung: 17.05.2018

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Acknowledgements

First of all, I would like to express my gratitude to my supervisor, Christof Rapp, for providing the bright example of a different way of approaching ancient texts and philosophical problems than I had been accustomed to, as well as for providing me with financial support.

My gratitude goes especially to Andreas Anagnostopoulos, who made the effort of commenting on my chapters, challenged and helped me immensely to refine my ideas and get them clearer on paper (as well as to cut the less promising ones).

I feel privileged for having joined *Musaph* and its amazing group of researchers. Peter Adamson and Laura Castelli have been glorious models to look up to. The numerous international scholars involved in excellence programs (Alan Code, Henry Mendell, Tim Clarke) have, both directly and indirectly, provided decisive stimuli for my research. A special place is occupied by those colleagues with whom I have shared my PhD experience more closely. Antonio, Marilù, Hugo, Melina and Andreas have often provided a bright example as well as friendly encouragement.

Writing a dissertation is painstaking work. Or at least it has been so for me. Through the years, there have been interminable phone calls, conversations, encouragement speeches and gentle rattlings. I could not have completed my dissertation without the loving petulance of my mother, the long chats over the phone with many friends, the radiant optimism of Mateo and Giordana, the advice of friends who had already gone through it, the joy brought by the singing lessons of Ernesto.

Note to the reader

All translations are mine, unless otherwise indicated. They often lack elegance, since I have tried to remain as close to the Greek text as possible. This is always provided, along with the indication of the critical editions used. I have chosen to print the most recent critical editions available, but I have consulted a large number of previous critical editions and divergences from the chosen critical edition are invariably signalled.

The Greek text of the *Physics* is taken from Sir William David Ross' 1936 Oxford critical edition. For what regards the first book of the *Physics*, I could profit from the critical apparatus provided by Prof. Dr. Oliver Primavesi during a seminar at *Musaph* dedicated to this text.

The Greek text of the *Metaphysics*, unless otherwise indicated, is also Ross' 1924 Oxford critical edition. I have punctually confronted Ross' text with Jaeger's 1957 critical edition. Occasional diversions between the two texts are signalled.

I have made my best to keep the footnotes and bibliographical discussion within a reasonable limit. This has not been difficult for privation, since there is virtually no secondary literature on the topic. The extensive existing literature on matter has been curled according to relevant topics (e.g. prime matter or persistence). The literature on the form and on its relation with matter is exterminate, but has often little bearing on the enquiry of *Phys.I*, which is quite concise regarding the role of the form as a principle. Scholarship on the topic has rightly addressed other texts and issues that hardly surface in *Phys.I*, due to its introductory character. Instead of importing problems belonging to different contexts and speculations, I have decided to keep close to the Aristotelian text and to reconstruct the problems he is confronted with and the arguments he provides to solve them.

All abbreviations are taken from Liddell-Scott-Jones Greek Dictionary (LSJ), with the exception of *Metaph.* and *Phys.* instead of LSJ's *Meta.* and *Ph.*

Was ist denn
ein Hauch? und doch kriecht zwischen Tag und Nacht,
wenn ich mit offnen Augen lieg', ein Etwas
hin über mich. Es ist kein Wort, es ist
kein Schmerz, es drückt mich nicht, es würgt mich nicht,
nichts ist es, nicht einmal ein Alp, und dennoch,
es ist so fürchterlich, daß meine Seele
sich wünscht, erhängt zu sein, und jedes Glied
in mir schreit nach dem Tod, und dabei leb' ich
und bin nicht einmal krank: du siehst mich doch:
seh' ich wie eine Kranke? Kann man denn
vergehn, lebend, wie ein faules Aas?
Kann man zerfallen, wenn man gar nicht krank ist?
zerfallen wachen Sinnes, wie ein Kleid,
zerfressen von den Motten?

[Hugo von Hofmannsthal, *Elektra* (excerpt from Clytemnestra's monologue)]

0. INTRODUCTION.

0.1. The problem.

Positing privation as a principle of natural things is a somewhat bold move. A brief survey of the occurrences of the word στέρησις (privation) through the *Corpus*, by means of either TLG or Bonitz's *Index*, shows that privation belongs to the conceptual sphere of non-being, indeterminacy and absence. As negation and absence of a determinate form, the positive content of privation is nothing or close to nothing, so that privation is constitutively indeterminate. As non-being-F opposing to a particular form F, privation is ontologically dependent on the form F that it lacks. If forms and what is endowed with a form have the lion's share in Aristotle's catalogue of substances, privations seem to find no place in it.

This notwithstanding, Aristotle is committed to the idea that features such as being-unshaped, formlessness, scatteredness and similar privations qualify as principles. For instance, if the house is planks and bricks composed in a certain way into the form of the house, Aristotle posits as a principle of the house the scatteredness pertaining to the planks and bricks before the composition has taken place. Likewise, if a statue of Hermes is a certain portion of bronze informed by the figure of Hermes, the figurelessness pertaining to the lump of bronze before moulding has occurred qualifies as a principle. Such an endorsement is puzzling to say the least.

Accordingly, a first and major task of this study is to unfold Aristotle's rationale for positing privation as a principle. This rationale can be found in the central chapters of the first book of the *Physics*, a text which is both introductory and seminal. A long-standing tradition has seen *Phys.I* as a key-text of hylomorphism, namely for the doctrine that natural things can be explained in terms of matter and form. *Phys.I* does not only employ hylomorphism. More importantly, *Phys.I justifies* hylomorphism.

The first task of this study is to unfold the arguments for hylomorphism contained in *Phys.I.4-7*. These chapters, I argue, constitute an uninterrupted argument for the doctrine of the three natural principles. The argument for hylomorphism in *Phys.I* is achieved in two steps. First, by arguing for the triad of natural principles – matter, form and privation. Second, by selecting matter and

form as full-fledged principles and showing that privation is not on an equal footing with the other these.

The justification for endorsing privation as a principle lies in Aristotle's claim that opposition is a principle of natural things. If form is a principle, its opposite, privation, is also a principle. Thus, arguing for hylomorphism entails arguing that privation is a principle of natural things. Nonetheless, privation does not constitute the core of the doctrine of the three principles, which consists of matter and form.

Accordingly, a second task of this study is to show not only why privation must be assumed as a principle, but also why privation cannot be accepted as a full-fledged principle of natural things. *Phys.I.7* offers a reflection on the internal relation among matter, form and privation. Here, Aristotle provides two rationales for the defective aetiological status of privation.

First, if we consider the hylomorphic compound, privation does not belong to its constitutive elements. These are rather matter and form. Privation qualifies as a principle only in so far as it comes to coincide with matter, when matter is considered in abstraction from its form. Let us take the statue of bronze as an example. Matter (the bronze) and form (the statue) qualify as full-fledged principles, for they are the substantial elements of the statue of bronze. Privation, instead, qualifies as a coincidental principle, because it comes to coincide with a full-fledged principle, namely with matter. For, when we consider the bronze in abstraction from the form of the statue, then the bronze is deprived of its form and the privation of the statue inheres in it.

Second, privation can be reduced to a mode of the form, namely to its absence. In this connection, privation is a coincidental principle, because it comes to coincide with the other full-fledged principle of natural things, namely with the form.

0.2. The place of *Physics I*.

A solid tradition has speculated over the idea that *Phys.I* might not belong to the original bulk of the work called *Physics* and be rather the independent treatise mentioned in the lists of Aristotle's oeuvres under the title Περὶ τῶν ἀρχῶν, *On principles*. There is little doubt that *Phys.I*

is a self-contained text. Nonetheless, its connection with the rest of the *Physics*, and in particular with *Phys.II*, is evident.

Phys.I.1 opens by stating that the principles that are going to be searched for are those grounding natural science, and thus the rest of the *Physics*.[1] Moreover, the hylomorphic doctrine introduced in *Phys.I* constitutes the general framework for the explanation of natural things and phenomena. Matter and form constitute the internal principles of the doctrine of the four causes developed in *Phys.II*, which is invoked in *Metaph.VIII* as necessary for the answering the question on what substances is. The four causes are employed in *Metaph.XII.1-5* in order to explain natural substance. The resolution of the three principles model of *Phys.I* into the four causes model of *Phys.II* can be observed in *Metaph.XII.1-3*. Here, Aristotle first summarises the arguments of *Phys.I.5-7* for the triad of natural principles. Then, he lets privation drop, and implements the remaining internal principles (matter and form) with the external principles (the moving and final causes) into the four causes model.

Against this backdrop, *Phys.I* is most likely to be understood as introductory to *Phys.II* (as well as to other more complete accounts of hylomorphism), with which it shares the project of providing a causal explanation of natural things. The introductory character of *Phys.I* should not be understood in a denigrating sense. The importance of *Phys.I* is evident on at least two arguments.

First, no other text, to my knowledge, engages as diffusely in justifying the endorsement of matter and form as principles. The argument for hylomorphism occupies *Phys.I.4-7* in a winding and nuanced path stretching from the *endoxa* of the predecessors to the Aristotelian doctrine of the three principles. This path unwinds through a number of arguments and through the introduction of new layers to remedy the shortcomings of the triad of principles of the predecessors. Understanding the arguments of *Phys.I.4-7* enables us to achieve a deeper understanding of what kind of principles are searched for in *Phys.I*, and thus of the scope and character of hylomorphism.

Second, there is a sense in which the four causes model surpasses and substitutes the internal principles of *Phys.I*, for matter and form alone are not sufficient to account for the origin of

[1] Cf. *Phys.*, I.1, 184a10-6.

natural things. Since nature "never acts without an end", the final cause is necessary to account for natural things and phenomena. Since accounting for the nature of natural things is also, to some extent, accounting for their coming into being, the moving cause must be part of the causal account of nature. Despite the insufficiency of the account of *Phys.I*, there is a sense in which the four causes are reducible to the dyad of matter and form advocated here.

In standard cases of coming into being, the synonymy principle secures the identity in account among the formal, the final and the moving causes. In fact, a human being comes into being out of a determinate matter whose intrinsic end is the human being and through the action of another external human being. In this connection, the moving cause can be reduced to the formal cause with relation to the account: the father generating his child is formally one and the same with his child. The final cause coincides with the formal cause, for the matter out of which the human being comes into being is teleologically oriented towards one and only one form, the form of the human being, which represents the actualisation of its intrinsic capacity.

In this scenario, the picture of *Phys.I* presents the core of the more advanced doctrine of the four causes. On the one hand, it is incomplete, because, due to its introductory character, it does not bring in the complete teleological machinery of the four causes and of the capacity of matter. On the other hand, *Phys.I* advocates for the essential principles, matter and form, to which the more complex and complete doctrine of the four causes and teleological tendency can be reduced by virtue of the synonymy principle.

Thus, on the one hand, the hylomorphism of *Phys.I* internally requires to be complemented by the teleological and more complete causal theory of *Phys.II* and *Metaph.VIII*. On the other hand, matter and form constitute the core of more complete and complex causal accounts.

So far, I have expanded on the positive aspect of my claim that *Phys.I* is an introductory text, and only hinted at the fact that other texts present a more complex causal account of natural things. I offer now an overview of what *Phys.I* does not account for.

First, the triad of principles of *Phys.I*, further reduced to the dyad of matter and form, fails to provide a sufficient account of the processes of coming into being of natural things. In order for matter to be actualised and informed, an external moving cause is needed. The menses that are

the human being in potentiality would not come to be the human being in actuality, if not through the action of an external agent, the father, that is himself a human being in actuality.

Second, *Phys.I* only touches upon the issue whether matter is prior to form or the other way round. The topic is a recurrent one in Aristotle's speculation, and it belongs to a mature hylomorphic account to assess whether matter or form is primary, and in which sense. *Phys.I* explicitly declares its failure to provide an answer to this issue.[2]

Third, the final cause has no role in *Phys.I*. Numerous natural substances and phenomena do not occur in vain, but rather in virtue of an end. Moreover, the perspective opened by the concept of potentiality (or capacity) and actuality is not in play in *Phys.I*. *Phys.III* grounds its account of change on the concepts of potentiality and actuality.[3] *Phys.I*, in undertaking the same project, confines its account of change to the couple of opposites and the underlying substrate.

The absence of the final cause and of a dynamic perspective are to be considered as complementary in the failure of *Phys.I* to account for a teleological perspective. In fact, what is missing in *Phys.I* is a reflection on the orientation towards an end of the intrinsic capacity of matter, which can be found in *Phys.II* and *Metaph.VIII*.

Phys.I.9 represents the natural bridge from an introductory, non-teleological causal account nature and of hylomorphism to a more complex and teleological account thereof. The positive, full-fledged teleological doctrine developed in *Phys.II* is built out of the criticism to a conceptual apparatus that Plato glimpsed, but failed to understand properly.

In *Metaph.*, I.6, 988a14-7, Plato is acknowledged as one of the few philosophers who (although quite unsuccessfully) attempted to provide a teleological explanation of nature. *Phys.I.9*, employing a language of Platonic flavour, discusses the aporias raised by Plato's failure to distinguish matter from privation, and therefore from non-being. In this connection, the Platonic doctrine of natural principles is faced with the charge of overlooking the difference between being one in number and one in capacity (δυνάμει). Moreover, the Platonic identification of matter with privation and non-being clashes with another Platonic assumption, namely that matter "yearns for" the form. If matter has a natural tendency for the form; if matter coincides

[2] *Phys.*, I.7, 191a19-20.
[3] Be here sufficient to remind of the notorious, and controversial, definition of change in *Phys.*, III.1, 201a10-1: "the actuality of that which potentially is, *qua* such, is change" (Hussey 1993 (1983), p.2).

with the privation of the form; and if the opposites form and privation are incompossible; then, matter will be destroyed once it receives the form it tends to. *Phys.I.9* confines itself to the task of bringing to the fore the internal inconsistency of Plato's theory of the natural tendency of matter, and it does so by way of coupling it with Plato's failure to account for the capacity of matter.

In conclusion, I have tried to map the relation of *Phys.I* with other key-texts providing a causal account of natural substances. *Phys.I* represents a justification of the essential explanatory tools of matter and form. Nonetheless, in its introductory character, *Phys.I* fails to account for: the external natural principles, a full-fledged teleological perspective and the issue on the priority of matter or form.

0.3. The principles of natural things in *Phys.I*.

In this work, I maintain that the topic of *Phys.I* are the principles of change, thus curling the distinction between principles, causes and element drawn elsewhere. According to the *locus classicus* for the reciprocal distinction among these three terms (*Metaph.V.1-3*), principle (ἀρχή) is the genus of both cause (αἰτία) and element (στοιχεῖον), whereas the latter two are reserved for, respectively, the external and the internal principles. There is little doubt that the triad of principles advocated in *Phys.I* belongs to the kind of the internal principles or elements, in opposition to the moving cause and the final cause.[4] The term στοιχεῖον, however, is used scantly in *Phys.I*, and not in opposition to the term αἰτία. Moreover, in other contexts, the term αἰτία is coextensive with the term ἀρχή and covers both the internal and the external principles.[5]

It appears evident that the causal vocabulary employed in *Phys.I* is neutral about the distinction drawn in *Metaph.V.1-3*. The opening of *Phys.I* contains the terms principle, cause and elements twice, first joined together the conjunction ἤ and subsequently by the conjunction καί.

> *Phys.*, I.1, 184a10-16
>
> Ἐπειδὴ τὸ εἰδέναι καὶ τὸ ἐπίστασθαι συμβαίνει περὶ πάσας τὰς μεθόδους, ὧν εἰσὶν ἀρχαὶ ἢ αἴτια ἢ στοιχεῖα, ἐκ τοῦ ταῦτα γνωρίζειν (τότε γὰρ οἰόμεθα γιγνώσκειν ἕκαστον, ὅταν

[4] Cf. *Metaph.XII.1-4*, that commentators have rightly noticed to contain a summary of the results of *Phys.I* (Charles 2000; Rapp 2015).
[5] Cf. *Phys.II.1*.

> τὰ αἴτια γνωρίσωμεν τὰ πρῶτα καὶ τὰς ἀρχὰς τὰς πρώτας καὶ μέχρι τῶν στοιχείων), δῆλον ὅτι καὶ τῆς περὶ φύσεως ἐπιστήμης πειρατέον διορίσασθαι πρῶτον τὰ περὶ τὰς ἀρχάς.
>
> And since, out of all researches, knowledge and science occur – with relation to the things of which there are principles and causes and elements – when these are known (for we believe that we know something, when we know the primary principles and the primary causes and [when we have reached] as far as the elements). Thus, it is evident that, also in the science of nature, it must be attempted to discern primarily what is related to the principles.

The first occurrence may suggest that we ought to grasp either the principles or the causes or the elements of nature. This may be corroborated by the final mention of the principles alone (lines 15-6). Moreover, the term ἀρχή is used consistently throughout *Phys.I.4-6*.

The second occurrence might appear to suggest a cumulative endeavour (i.e. grasping the principles *and* the causes *and* the elements of natural things), thus implying that there must be a difference between the three terms.

However, this impression is dispelled if we understand καί as epexegetic. If this is the case, then the endeavour prescribed by our passage is rather to search for the principles, i.e. the causes, i.e. the elements of natural things. In this case, it is clear that Aristotle uses the terms principle, cause and element as synonyms, and that the first, disjunctive occurrence of the terms must be understood in a broad sense.

Moreover, the term στοιχεῖον is omitted in the crucial passage of *Phys.*, I.7, 190b17-20, where we would most expect it to be used in its technical, narrow sense. Aristotle here draws the conclusion of his enquiry into the internal principles and elements of natural things, and uses the terms ἀρχή and αἰτία to label them.

In conclusion, in the causal vocabulary of *Phys.I*, the terms ἀρχή, αἰτία and στοιχεῖον are employed as synonyms for the internal principles.

0.3.1. The basic definition of principle in *Metaph.V*. Source condition and priority condition.

It is not my intention to tackle here the numerous issues related to Aristotle's views on causality. An extensive literature has been produced on the topic, part of which deals with problems that

are quite remote from the introductory perspective of *Phys.I*. Here, I deal only with two conditions set in the definition of principle (ἀρχή) contained in *Metaph.V.1*, and that also apply to the definition of cause (αἰτιον) and element (στοιχεῖον) in *Metaph.V.2-3*. If we admit that these three concepts exhaust the realm of the causes in Aristotle, then the two conditions analysed here must be taked to apply to the whole spectrum of causality.

My claim is that, according to the basic definition of principle presented in *Metaph.V.1*, X is a principle of Y, if it fulfils two conditions:

(1) The *source condition*, namely if X is that-out-of-which with relation to Y (i.e. if X is the source of Y);

(2) The *priority condition*, namely if, given a Z that is also a source of Y, X is prior to Z. That is, X is a source of Z (and of Y).

> *Metaph.*, V.1, 1013a17-20
>
> πασῶν μὲν οὖν κοινὸν τῶν ἀρχῶν τὸ πρῶτον εἶναι ὅθεν ἢ ἔστιν ἢ γίγνεται ἢ γιγνώσκεται: τούτων δὲ αἱ μὲν ἐνυπάρχουσαί εἰσιν αἱ δὲ ἐκτός.
>
> What is common to all principles it to be the first that-out-of-which [their results] either are or come to be or are known. And some of them are internal, whereas others are external.

There are three elements in the definition of principle. In short, a principle of something is the primary source out of which this something φs. I leave aside the causal action expressed by φ, as it is a topic for the next section. Let us for now abstract from the quality of the causal action performed by the principle and consider a partial definition of principle as "the primary that-out-of-which" of its results.

(1) The source condition (SC). The causal language employed by Aristotle consistently features "out of" (ἐκ) formulas. Points are principles of lines, for they are that-out-of-which (τὸ ἐξ οὗ) of lines. A lit candle is the principle of the blaze that destroyed someone's house, for the lit candle is that-out-of-which of the blaze. The impulse given by a cue hitting ball 8 is the principle of the rectilinear movement of ball 8; the impulse transmitted by ball 8 onto ball 1 is the principle of ball 1's falling into the pocket and, consequently, of me winning the match. In fact, in both cases, the former member is that-out-of-which of the second member.

These situations quite uncontroversially describe a causal relation between two events, things or phenomena. The first member of this relation is the principle of the second member, which is the effect or result or object of the principle. In order for the linguistic qualification of causality through the ἐκ-language to yield something relevant for causality, two questions must be posited and answered.

In other words, are the above-mentioned principles necessary or non-necessary, sufficient or non-sufficient?

Necessary: if X is a principle of Y, then X is that-out-of-which of Y.

Sufficient: if X is that-out-of-which of Y, then X is a principle of Y.

In *Phys.I.5*, Aristotle seems to assume the sufficiency-option, for he concludes from the observation that the contraries fulfil the source condition (and priority condition) to the claim that contraries are principles.

Admittedly, there is some difference between my first geometric example on one side, and the second and third examples on the other side. If we consider the line as a single phenomenon that can be drawn or not drawn, then it is clear that the point I draw when I lay the tip of my pencil onto the paper necessitates the line, but is not sufficient for its existence. In fact, I may confine myself to drawing the point. Thus, with relation to the single line that I may or may not draw, the point is a necessary but non-sufficient principle. There seems to be, instead, another sense in which the point may be regarded as sufficient. In fact, the following statement is true: "if there is a line, then there is a point." The difference seems to lie in the fact that there is a particular grounding relation between the point and the line, where the point is necessarily a component of the line. We can object that the line is composed out of semi-lines, but semi-lines are in turn composed out of points. Thus, the point is a sufficient principle of the line, but a non-necessary one (for I may confine myself to drawing the point).

Now, is the relation between SC and principles similar to the point/line model? There are two evident difficulties for this.

First, let us take different examples of ἐκ-formulas in Aristote's *Corpus*. The day is that-out-of-which of the night; the night is that-out-of-which of the day. This is meant is a merely temporal

sense; in fact, neither is day a principle of night nor the other way round.[6] Furthermore, ἐκ can express mereological relations such as "the whole is out of the parts" and "the parts are out of the whole".[7] In neither of the two cases, a causal relation is implied. Thus, the simple fact that X fulfils SC (that X is that-out-of-which of Y) cannot be sufficient for X to qualify as principle.

Second, the priority condition (PC) is also required for X to qualify as a principle. Thus, the relation between PC and SC must be clarified with relation to their status.

Third, *Phys.I* does not deal with sufficient, but only with necessary principles. In fact, its causal description is incomplete (the moving cause and the final cause are missing). Furthermore, the internal and external concauses have no place in its account. For instance, the internal resistance and external impediments for the fulfilment of a causal action are not part of the picture of *Phys.I*. Considering again the second, the lit candle may fail to start a blaze, because it is placed too far from the closest inflammable stuff or because the quantity of heath is too small. None of these considerations is part of the account of *Phys.I*. The role of the concauses has some bearing on SC as well. In fact, it seems implausible that SC may be regarded as sufficient for X to qualify as a principle, if the concauses can undermine the fulfilment of the causal action of X.

This having been said, there may be some conceptual ground to save the sufficiency of SC that seems to be required by the arguments in *Phys.I.5*. The second problem may be managed by assuming as a hypothesis that SC and PC are sufficient when taken in conjunction. The third problem may be tackled by making clear what kind of principles *Phys.I* searches for with relation to the fulfilment of their causal action. *Phys.I* seems to search for the Xs that sufficiently qualify as principles, rather than for the Xs that are sufficient to the fulfilment of a causal action. The distinction I want to make here may be captured by the distinction de facto/de jure. The Xs that *Phys.I* selects as principles seem to be those Xs that must fulfil certain conditions (SC and PC), although they must not de facto fulfil a certain causal action. In fact, the causal description of *Phys.I* is partial both with relation to the kinds of principles and to the concauses.

This may be easily taken to support the view that the principles of *Phys.I* are only necessary. Instead, I want to try to make conceptual space for the idea that Aristotle endorses a de jure sufficiency of necessary, non-sufficient principles. Matter, form and privation must be meant as

[6] *Metaph.*, V.24, 1023b5-11.
[7] *Metaph.*, V.24, 1023a31-b2.

necessary, non-sufficient principles, for they do not exhaust the kind of the principles and concauses that are necessary and sufficient for a certain causal action to be fulfilled. Nonetheless, Aristotle, in arguing in *Phys.I.5* from SC and PC to the principles, may be taken to state sufficient conditions for X to qualify as a necessary principle, or de jure sufficient conditions for X to qualify as a principle (i.e. regardless of the fulfilment of its causal action).

This brings us to reconsidering the first problem mentioned above. It is possible that SC may be considered by Aristotle as sufficient (when it is taken in conjunction with PC) with the proviso that ἐκ has a causal sense. This is quite tautological and amounts to ground the notion of principle on that of causality, such that X is a principle, if, given a causal relation CR, X is the primary that-out-of-which of CR. Nonetheless, in dealing with primary concepts, this circularity may be the best Aristotle can get to. Assessing whether the relation in which X qualifies as a principle is or is not a CR may hinge to some extent on the consideration of the causal field of the principle, to which the next section is devoted.

(2) The priority condition (PC). In selecting that-out-of-which of a certain result Y, we may come up with a plurality of sources. For instance, both the stroke of the cue on ball 8 and the impulse transmitted by ball 8 onto ball 1 can be considered that-out-of-which of the fact that ball 1 falls into the pocket. All PC prescribes is that, given a source X and a source Z that both qualify as that-out-of-which of Y, X is a principle of Y rather than Z, if X is that-out-of-which Z.

Unlike other passages in which Aristotle endorses that the relevant principle of Y is the most proximate principle ending with the result Y, *Phys.I* deals with, one may say, the remote principles.[8] For instance, in my interpretation, the second argument of *Phys.I.5* follows two steps. First, it selects the sources of a certain change as the components of a certain logical range. E.g., for the change of colour, white, black (X) and all the intermediate colours that are included between these (Z). X and Z are the sources of the change of colour. Second, it shows that the intermediate colours in fact derive from white and black. For, they are in a certain sense a mixture of white and black. Thus, X (white and black) are principles, for they are sources of the change of colour, and they are primary with relation to the other sources (i.e. the intermediate colours) as well. The intermediate colours do not qualify as principles, for they do not fulfil the priority condition, but only the source condition.

[8] Compare, for instance, *Metaph.*, VIII.4, 1044b1-3.

Summing up, I have claimed that Aristotle states in *Metaph.V.1* two conditions for being principle: SC and PC. I have tried to make conceptual space for Aristotle's assumption in *Phys.I.5* that SC and PC are sufficient conditions for qualifying as a principle. If my attempt is judged a failure, then Aristotle's arguments in *Phys.I.5* appear less cogent than we would wish.

0.3.2. The causal field of the principle. Principles of being, principles of change.

In the previous chapter, I have focused on four elements of the concept of principle: the principle itself, the two conditions for being principles (SC and PC) and the results of the principle.

I here take for granted a fact that should be as uncontroversial as it gets: that the concept of principle is a relational one. With the term "relational" I mean nothing more than the fact that a principle is always a principle *of something else*. A principle is a principle *of something else* in at least two main senses.

In the first sense, we say that X is the principle *of* its result or object Y. Spelling this out with relation to SC and PC, X is a principle of Y, if Y φ-s out of X, and there is no Z out of which X φ-s. For instance, the point is the principle of the line, the line is the principle of the surface and the surface is the principles of the solid. In all cases, in fact, the former term is that out of which the latter term φ-s (for φ=being composed of).

In the second sense, X is principle of a certain quality of the causal action, namely of a certain *causal field* (φ).[9] For instance, water is a principle of change in the transformation of water into air, but a principle of ontological composition for the bile. The causal actions of water in these two contexts are obviously qualitatively different.

Thus, from an object-related point of view, water is a principle, respectively, of air and of the bile. From a field-related point of view, water is a principle of change with relation to water, and a principle of being or ontological composition with relation to the bile.

[9] I borrow the notion of causal field from two classics of the debate on causality: Anderson 1938, pp.126-136; Mackie 1965, pp.248-252.

Let us consider the enquiry of *Phys.I*. From an object-related point of view, enquiring into the principles of natural things amounts to searching for what is causally responsible for a set of beings, τὰ φυσικά, that are such and such. Namely, of the set of beings that are essentially capable of change and perceptible.

Nevertheless, such a general statement of purpose lacks the determinacy allowing for a sound answer, as looking for what is causally responsible for natural beings does not inform us on the causal action performed by the principles. As it seems, the fundamental question of natural science which *Phys.I* tackles, namely "what are the principles of natural beings?" is a complex one and needs to be spelled out with respect to the causal field of the principle.

At least three different fields are relevant in the inquiry of *Phys.I*.

In the first sense (a), the principles whose pursuit is announced in the first lines of *Phys.I.1* are the principles of natural science, i.e. the principles *of knowledge* of natural things. If Y is something that can be known and X causes the knowledge of Y, then X is the principle *of knowledge* of Y. As a general outset, the principles sought for in *Phys.I* are the fundamental principles of natural science, for they are the explanatory principles of the objects of natural science, i.e. of natural things. But what are the principles of natural things and what are they explanatory of? An answer to this question is likely to be found by considering the second and third causal field of the principles of natural things.

In the second and third sense, as I show in the next two chapters, *Phys.I.5-6* present two pairs of arguments claiming that the contraries and the substrate are the principles of natural things, respectively, with relation to being and with relation to change.

In the second sense (b), the principles searched for are the principles *of being* of natural things. X is a principle of being of Y, if X causes Y to exist or (i.e.) to be what Y is. I will further specify what I take this to mean.

In the third sense (c), the principles searched for are the principles *of change* of natural things. X is principles of change of Y, if Y is something that is capable of undergoing change (as natural things are essentially), and X causes Y to undergo change.

With regard to the general scope of *Phys.I*, I claim that Aristotle thinks that finding (a) the principles of natural science, namely providing an answer to the general question "what are the principles of natural things?", amounts to answering two distinct but not completely independent questions with relation to (b) and (c):

QB (question on being): "what are the principles *of the being* of natural things?";

QC (question on change): "what are the principles *of the change* of natural things?".

This may seem to lead to the unwanted consequence of splitting the unity of the results of *Phys.I* into two different questions with two different results:

PB (principles of being): X is principle of natural things as it causes their being;

PC (principles of change): Y is principle of natural things as it causes change in them.

I think that this is not how Aristotle sees the point. As a matter of fact, Aristotle identifies PB and PC in a central passage of *Phys.I.7*, where he provides with great emphasis his answer to the general question of *Phys.I* "what are the principles of natural beings?" The principles of natural things searched for in *Phys.I* are such to answer both QB and QC, thus qualifying both as PB and as PC of natural things.

> *Phys.*, I.7, 190b17-20
>
> φανερὸν οὖν ὡς, εἴπερ εἰσὶν αἰτίαι καὶ ἀρχαὶ [a] τῶν φύσει ὄντων, ἐξ ὧν πρώτων [b] εἰσὶ καὶ γεγόνασι μὴ κατὰ συμβεβηκὸς ἀλλ'ἕκαστον ὃ λέγεται κατὰ τὴν οὐσίαν, ὅτι γίγνεται πᾶν ἔκ τε τοῦ ὑποκειμένου καὶ τῆς μορφῆς·
>
> In conclusion, if there are causes and principles of natural things, primary [sources] out of which they [a] are and [b] have come into being non-coincidentally, but rather each said according to substance, it is evident that every [natural thing] comes into being out of the substrate and the form.

I will comment more fully on the passage in §5.7. Here, I confine myself to showing how the text confirms my claims. First, I have claimed that the question about natural principles presents two layers (compare [a] and [b]), which I will call, borrowing Mackie's[10] terminology, the *object-related* and *field-related* layer.

[10] Mackie 1965.

With object-related layer ([a]), I mean to say that a principle is always a principle *of* something, in the sense that its causal efficacy acts *on a certain object* or *on a certain set of objects*. The same principle X, say fire, can manifest its causal efficacy on a variety of different inflammable things: paper, dead leaves, wood, alcohol. Each of these inflammable things are the objects on which the causal efficacy of the principle acts. The principles that *Phys.I* enquires into are, on an object-related point of view, the principles of natural beings, namely the principles of that set of beings that is individuated by the differentia of being capable of change.

With field-related layer, I mean to say that a principle is always a principle *of* something, in the sense that it causes *a certain effect* with relation to a set of objects. There is a certain number of effects that can apply to the same object Y. A heap of dead leaves, when it is exposed to the presence of fire, can: change its colour during the process of combustion; change its spatial position; cease to exist when the process of combustion has been fulfilled. Changing colour, location and ceasing to exist are different causal actions performed by one and the same principle (fire) on one and the same object (a heap of dead leaves). Each of these causal actions falls under a different causal field: qualitative change; locomotion; substantial change or being (in fact, we can consider the cessation of existence of a heap of dead leaves either as a process or as a state).

Now ([b]), the set of principles *Phys.I* searches for is, from a field-related point of view, the set of principles that are responsible both for the being and for the capacity to change of natural things. There is a certain degree of indeterminacy in the expression ἀρχὴ τῶν φύσει ὄντων ἐξ οὗ [τὰ φύσει ὄντα] εἰσί that rests on the meaning of εἶναι.

At least two interpretations are viable. On the first one, εἶναι has an existential meaning, so that the principles are responsible for the existence of natural things. On the second interpretation, εἶναι addresses the essence of natural thing, so that the principles are responsible for the fact that natural things are what they are. I believe on two main grounds that the second option is the most plausible one. First, and foremost, the argument for matter and form to qualify as principles that follows our passage hinges on definition and essence. Matter and form are principles of being (and change), for they are parts of the definition and essence of the natural thing they constitute.

Second, *Phys.I* deals with necessary, non-sufficient principles of change. Thus, the same items that are principles of change cannot account for the existence of their results.[11]

My interpretation on the twofold explanatory task of the principles in *Phys.I* may be contested by appealing to the fact that, although bringing together being and capability to change in line 18, Aristotle refers only the latter where he lists the natural principles (line 20: γίγνεται πᾶν ἔκ τε τοῦ ὑποκειμένου καὶ τῆς μορφῆς). This would still give ground to the traditional idea that what is at stake in *Phys.I* are the principles of change. What follows in lines 20-3 seems nevertheless to reject this idea. In fact, the argument provided by lines 20-3 is one that regards the constituents from which natural things *are*: σύγκειται γὰρ ὁ μουσικὸς ἄνθρωπος ἐξ ἀνθρώπου καὶ μουσικοῦ τρόπον τινά. A second and different argument (lines 22-3) appeals to the fact that matter and form are parts of the essence of natural things.

The inherent elements out of which natural things *are composed*, namely substrate and form, are identified with the principles out of which natural things have come into existence, namely with the principles of (substantial) change of natural things. In other words, in so far as X is a principle *of being* with respect to natural things, it is also a principle *of change* with respect to them.

As a compositional language characterises the argument for matter and form as principles of being, and as I believe that matter and form are principles of being in the sense that they account for the essence of natural things, I refer to the principles of being as the principles of ontological composition. By ontological constituents of elements, I refer to a relation part-whole that is not merely mereological or spatial, but rather ontological. The arm is a mereological element of the human being; Sparta is a spatial part of the Peloponnese. In both cases, the element does not bear

[11] *Pace* Bolton 1991, p.22-4. Bolton does not mention a distinction between principles of change and principles of being. Nonetheless, he seems to assume that the principles of natural things are explanatory both of the capacity for change and of the existence of natural things. On this latter function of the principles of natural things: "[…] in natural science the principle that nature, the realm of naturally changing things, exists can be more fully spelled out as the principle that form, privation and substratum exist" (p.23). Nonetheless, in expanding on the former function of natural principles, Bolton endorses (against Irwin 1988, pp.70-1) that the opposites are necessary, non-sufficient principles of change. Now, it may seem reasonable to believe that the same principles that are necessary with respect to change are also necessary with respect to being. Substrate, form and privation are not sufficient for a natural substance to come into existence (to have undergone substantial *change*). Rather, the existence of natural things may be guaranteed by the addition of the moving cause and, in most cases, of the final cause (plus by the absence of external impediments and by other necessary conditions). The principles of beings searched for in *Phys.I*, thus, are meant to be: either necessary, non-sufficient principles of the existence of natural things or principles of their nature or both.

relevance to the definition and essence of the whole. The human being is such even if one-armed; the Peloponnese would be a peninsula stretching into the Aegean Sea even in the unfortunate case in which Sparta should be swept away by an earthquake. By ontological constituents, instead, I refer to the parts of substance without which the whole would simply not be the same whole it is. Let us anticipate a terminology that will be used extensively in this work. If M stands for matter and F^+ stands for form, then natural things are in a strong, essential sense, MF^+. By this, I do not want to commit to the view, refuted elsewhere, that substance is the sum of matter and form understood as ingredients. Rather, I want to address the weaker claim that matter and form are necessary components of the essence of the natural things they constitute, whatever their reciprocal relation may be. The relation between matter and form is addressed in the last section of *Phys.I.7* and will be object of analysis in Ch.5.

Now, a problem arises from the picture I have been drawing. My claim on the twofold sense of the principles of nature may appear to duplicate the object of enquiry of *Phys.I*. In fact, it is reasonable to think that the principles of different fields (of being, of change, of knowledge…) are numerically and specifically different principles. The principles of knowledge of Socrates (i.e. of knowing that he is a man, namely the universals "biped", "rational" and "animal") will apparently not coincide with his principles of being (his individual matter and his form), nor with the reason why he heads towards the agora (the parts of his soul and body in charge of deliberation and movement, and the scope).

If we consider generally the case of the principles of natural things, it is *prima facie* difficult to see how PB and PC should coincide, that is, to see how that which effects the change of a natural being should also be the ground for its existence. Existing things undergo change in quality, quantity and place. The principles of these kinds of change obviously do not bear any role on the fact that the already existent Y undergoing these changes exists, or that it is such and such.[12]

[12] A certain parallelism between PB and PC may be saved if we hold with *Phys.V.1* that every non-substantial change is itself in some sense a generation/corruption, namely a γένησις τις. When Socrates becomes, say, pale, we can describe the phenomenon both as the qualitative change of a pre-existing substance and as the generation of the compound substance-quality "pale Socrates". Such a claim seems to leave conceptual room for reckoning pale as a principle of being of "pale Socrates". In fact, such an entity as "pale Socrates" exists only in so far as pale comes to coincide with Socrates. This notwithstanding, on two grounds I do not think that this is a path Aristotle wants to follow. Firstly, the status of substance-accident compounds in Aristotle's philosophy is controversial. Matthews (1982) has convincingly shown that, as the unity of this kind of beings is merely accidental, they would not qualify as substances and objects of science, but rather be some sort of "kooky objects" (partially against this claim: Lewis

This notwithstanding, *Phys.*, I.7, 190b17ff. shows quite clearly that Aristotle holds that *the same principles* are causally responsible both for the being and for the capability to change of natural things. The same principles are causally effective on one set of objects with respect to two different causal fields. The fact that principles of change and principles of being are coextensive is something that Aristotle is not eager to explain, but that seems to constitute the foundations of his enquiry into natural things in *Phys.I*. I claim that he has good reasons to hold it.

Let us return to the object-related layer of the principles searched for in *Phys.I*. Two points must be considered.

First, *Phys.*, I.7, 190b17ff. argues that the principles of natural things are actually the principles of natural *substances*. Thus, the identification proposed is not between principles of alteration (white, black; smooth, rough) and the principles of what natural things are, which would be absurd. Rather, the identification proposed is that between the principles of substantial change and the principles of being of something.

Second, the principles of natural things in *Phys.*, I.7, 190b17ff. are achieved through a diairetic argument introduced in *Phys.*, I.7, 190a31, which starts by dividing into its elements (matter and privation) a certain kind of substance, namely the starting point of substantial change or what-comes-into-being. *Phys.*, I.7, 190b17ff. represents the second step of this diairetic argument, namely the step in which Aristotle divide into its elements (matter and form) the end point of substantial change or what-has-come-into-being. What-has-come-into-being is no more than the natural substance that results from the process of (natural) substantial change.

Thus, combining the object-related layer with the field-related layer, the principles of natural things are explanatory both for the fact that natural substances have come into being and for their essence and ontological composition. This is thus the kind of identification assumed in *Phys.I* that is in need of explanation.

What are natural substances considered in general, as a province of being? In several passages, Aristotle contrasts natural beings to other provinces of being. Leaving aside the issue of the

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1982). Secondly and more importantly, I do not think that Aristotle is at any extent concerned in *Phys.I* with the principles of such objects as "pale Socrates". Rather, *Phys.I* is concerned with the principles of natural substances such a tree and a man; in short, with natural substances as hylomorphic compounds.

consistency of Aristotle's ontological partition, I claim that both *Phys.I* and other texts agree on the view that natural beings are those beings that are essentially capable of changing.

Phys.I recognises the capacity for change of natural substances as one of the fundamental premises on which natural science is grounded. In *Phys.I.2-3*, in fact, Aristotle engages in a refutation the Eleatic monism[13] and changelessness of being, on the ground that they undermine the possibility itself of natural science (*Phys.*, I.2, 184b25-185a12).

The essential feature of being changeable proper to natural things is not considered by Aristotle as something to be argued for. Rather, the capacity to change of natural beings is acknowledged as an empirically self-evident datum.

> *Phys.*, I.2, 185a12-14
>
> ἡμῖν δ' ὑποκείσθω τὰ φύσει ἢ πάντα ἢ ἔνια κινούμενα εἶναι· δῆλον δ' ἐκ τῆς ἐπαγωγῆς.
>
> But we assume that natural [things] – either all or some of them – are in change. And this is evident by induction.

At least two points about this short passage are worth noticing.

Firstly, the passage is inserted in a broad context stretching from *Phys.*, I.2, 184b25 to the end of *Phys.I.3*, which is mainly devoted to the refutation of the Eleatic claim that being is one. In lines 12-4, Aristotle dismisses the Eleatic claim that being is changeless, referring to the presumed evidence that natural things undergo change. No further attempt to refute the Eleatic claim on the changelessness of being is made until *Phys.I.8* solves the famous aporia on the possibility of change. Moreover, in *Phys.I.4-7* Aristotle seems to take for granted that natural things undergo change, as he argues for the principles of natural things (also) on the basis of the way in which natural things undergo change. *Phys.I.5* even lists Parmenides among the Physicists who explained change by way of positing the contraries as principles.[14]

Returning to our passage, the use of the verb ὑπόκειμαι may suggest that Aristotle in *Phys.I.2* simply assumes changeability as a self-evident feature proper to natural things and leaves it for

[13] As I read it, the argument against monism has the form of a *modus ponens* in two steps: If there is science → there is (at least) one principle (cf. *Phys.*, I.1, 184a10-6). If there is a principle → there is also (at least) one result. There is science ⊨ there is (at least) one principle and there is (at least) one result. Therefore, being cannot one, but is rather many.

[14] *Phys.*, I.5, 188a20-2.

further discussion (i.e. to *Phys.I.8*) to refute the wrong reasoning that had lead Parmenides to deny this datum of experience.[15]

Second, my claim may be mitigated by the restriction Aristotle adds with the words ἢ ἔνια. If changeability belongs only to a subset of the natural things, then my claim that changeability is a necessary, essential differentia of the set of natural beings as a whole is threatened. Nevertheless, parallel passages show with sufficient solidity that this limitation should be taken merely as a cautionary note due the fact that Aristotle does not mean to settle the question beyond referring to what is self-evident and therefore universally accepted (with the exception of the Eleatics, who had lost track of the phenomena because of their wrong reasoning). Aristotle often delimits natural science from mathematics and from the science of being with relation to their respective objects of enquiry. Differently from the other two theoretical sciences, natural philosophy deals with the set of things that, by definition, have a principle of change in themselves (coinciding with their nature). Far from pertaining only to a subset of the natural things, being changeable is a necessary, essential feature of natural things.

A *locus classicus* for Aristotle's partition of substance is *Metaph.XII.1*.

> *Metaph.*, XII.1, 1069a30-b3
>
> οὐσίαι δὲ τρεῖς, μία μὲν αἰσθητή — ἧς ἡ μὲν ἀΐδιος ἡ δὲ φθαρτή, ἣν πάντες ὁμολογοῦσιν, οἷον τὰ φυτὰ καὶ τὰ ζῷα [ἡ δ᾽ ἀΐδιος] — ἧς ἀνάγκη τὰ στοιχεῖα λαβεῖν, εἴτε ἓν εἴτε πολλά· ἄλλη δὲ ἀκίνητος […] ἐκεῖναι μὲν δὴ φυσικῆς (μετὰ κινήσεως γάρ), αὕτη δὲ ἑτέρας, εἰ μηδεμία αὐτοῖς ἀρχὴ κοινή. ἡ δ᾽ αἰσθητὴ οὐσία μεταβλητή.
>
> And [there are] three [kinds of] substances. The first one is the perceptible substance – and of this, one [kind] is eternal, another [kind] is corruptible. And on this [latter kind] (e.g. plants and animals), everybody agrees. […]. The other [kind of substance] is not subject to change […]. And those [kinds of substance] are [the object] of natural science, for they are twined with change. […] Perceptible substance is capable of change.

Leaving aside the numerous interpretative issues raised by this text, what is relevant to my argument is that Aristotle identifies the province of being falling within the scope of natural science as a that of the substances that are perceptible and capable of change. These two characters of natural substances are evidently not to be understood as coincidental ones, for they

[15] For this use of the imperative 3rd person singular of ὑπόκειμαι: *EN*, II.2, 1103b31-4: τὸ μὲν οὖν κατὰ τὸν ὀρθὸν λόγον πράττειν κοινὸν καὶ ὑποκείσθω – ῥηθήσεται δ᾽ ὕστερον περὶ αὐτοῦ, καὶ τί ἐστιν ὁ ὀρθὸς λόγος, καὶ πῶς ἔχει πρὸς τὰς ἄλλας ἀρετάς. "Now, that we must act according to right reason is a common principle and must be assumed–it will be discussed later, i.e. both what it is, and how it is related to the other excellences." (ROT)

identify a certain province of being instead of others. Thus, natural substances are those substances that are *essentially* perceptible and capable of change.

In clarifying the peculiarity of ontology as a science that is not confined to a particular province of being, but rather enquires into being *qua* being – *Metaph.VI.1* defines the object of natural science in the following way.[16]

> *Metaph.*, VI.1, 1025b18-21
>
> […] ἡ φυσικὴ ἐπιστήμη τυγχάνει οὖσα περὶ γένος τι τοῦ ὄντος (περὶ γὰρ τὴν τοιαύτην ἐστὶν οὐσίαν ἐν ᾗ ἡ ἀρχὴ τῆς κινήσεως καὶ στάσεως ἐν αὐτῇ)
>
> […] natural science happens to deal with a certain genus of being (for it deals with that certain kind of substance in which the principle of change and rest is in [the thing] itself).

Similarly, the opening of *Phys.II.1* notoriously distinguishes between things whose cause is nature and things whose causes are different from nature. And nature is the principle of change and rest inhering by definition in the beings that qualify as natural things.

In conclusion, the passages discussed above, along with evidence from *Phys.I.2* (when it is interpreted correctly), have shown that natural things are those things that are *essentially* capable of change.

The cumbersome fact that Aristotle argues for the principles of natural things by way of enquiring into the principles of substantial change may find an explanation in the intersection between three ideas.

First, from an object-related point of view, the principles we are looking for are the principles of natural substances as what-has-come-into-being. Namely, we are looking for the substances that are results of processes of coming into being.

Second, changeability is an essential feature of natural things. Natural thing $=_{def}$ a thing that has capacity for change (and is perceptible).

Third, from a field-related point of view, the principles of being of natural things account for what natural things are, namely for their essential features or nature.

[16] *Metaph.*, XI.7, 1064a28ff.

The concurrence of these three claims enables to account for the claim about the principles of natural beings that I see in play in *Phys.I*. The principles accounting for what natural things are (the principles of being) are the same principles accounting for the fact that natural things are capable of change (the principles of change), for being capable of change belongs to what natural things essentially are.

0.4. Method in *Phys.I*.

Phys.I represents a favourite battlefield for the debate on Aristotle's method for the enquiry into the first principle of science triggered by Owen's groundbreaking contribution to the topic.[17] Notoriously, Owen claimed that the process of enquiry into the first principles hinges on dialectic, and thus on *endoxa* (the agreement of everybody or of all philosophers). Thus, Owen rejected the traditional views on the topic indentifying either experience[18] or deductive reasoning as sources of the knowledge of the first principles.

The influence of Owen has been enormous and still reverbereates in contemporary scholarship.[19] Irwin's extensive monography on the topic is the paramount example of a complete endorsement of Owen's perspective.[20] The first sixty pages of Irwin's book contain a detailed analysis of passages from *Phys.I* supporting the importance of *endoxa* and dialectic in the enquiry into the first principles of natural science.

Wolfgang Wieland devoted an entire book to the method of *Phys.I*, expanding Owen's dialectical perspective of collection and evaluation of the authoritative *endoxa* into the analysis of everyday speech typical of his *Zeitgeist*.[21] In Wieland's expanded dialectical approach, the first principles of natural science are gained through the analysis of the way in which the Greek

[17] Owen 1961. Owen's view had been anticipated by Le Blond 1939, pp.46-7 and Weil 1975 (1951). Giving account of the debate over the question whether dialectic is or is not Aristotle's philosophical method for the enquiry into the first principles falls out of the scope of the present work. Notable champions of Owen's interpretative line are Brunschwig (1967, pp.XIV-XVIII) and Evans (1977). Decisive criticism to this interpretative line has been advanced by Bolton (1987, 1990, 1991), Smith 1993, Mesch 1994, Primavesi (1996, pp.17-20, 31ff.). For an assessment: Rapp 2002, Vol.I, pp.244ff.
[18] Jaeger 1955 (1923), pp.309-27 and 346ff. With relation to biology in particular: Düring 1943, pp.22-3; Lloyd 1968, pp.71-80.
[19] For an overview: Bolton 1987, p.121, n.4.
[20] Irwin 1988.
[21] Wieland 1970 (1962), esp. pp.216ff. Also: Wieland 1975.

Everyman commonly speaks about natural things and natural change. Common speech is, in Wieland's interpretation, a reservoir of agreed-upon concepts of reflection intuitively and for the most time unconsciously grasped by the speakers. Although Wieland's analysis is evidently biased by extrinsic concerns and blatantly mistranslates and misinterprets passages for the sake of making its point, it has proved extremely influential.[22]

For instance, Charlton, in the introduction to his edition of books I and II of the *Physics*, in dealing with the method, claims:

> […] the special technique of the dialecticial is to argue from *endoxa* […], which are, roughly speaking, propositions which cannot be proved, but which an opponent could not deny without seeming unreasonable, and this is Aristotle's technique in *Phys.* I-II: he constantly appeals to what is ordinarily said or thought […]; though he relies more on detailed linguistic analysis […] than the *Topics* may lead us to expect.[23]

The beginning of the passage testifies Charlton's debt to Owen; the last sentence for his sympathy, more than for Owen's restricted dialected method, for Wieland's expanded dialectical approach. The same holds for Jones' reconstruction of Aristotle's doctrine of the substrate in *Phys.I*.[24] The shortcomings of Jones' analysis lie chiefly in his failure to account for the importance of the arguments presented in *Phys.I.5-6* for Aristotle's enquiry into the principles of natural things. Rather, Jones' analysis concentrates on the linguistic analysis that occupies part of *Phys.I.7* and that Jones assumes to bear the whole burden of proof. This, nonetheless, amounts to overlooking several central passages of *Phys.I.5-6* and of *Phys.I.7* itself, and to mistaking a collection of linguistic data for the arguments provided to account for these data.

There is some natural appeal in the dialectical method. If the first principles of science are genuinely first, then they cannot be deduced from more prior principles. The belief in Aristotle's endorsement of a super-capacity grasping the first principles by intellectual intuition has the philosophical stance of a *deus ex machina* and is likely to have spuriously stemmed from the attempt to reconcile Aristotle with Platonism.[25] The idea that the first principles are drawn from experience is confronted with the well-known limits of empiricism; first and foremost, with the inevitable objection that a posteriori experience is never exhausted.

[22] For recent contributions on the epistemological value of *endoxa*: Frede 2012; Mies 2013.
[23] Charlton 1992 (1970).
[24] Jones 1974.
[25] I have provided an overview of the problem in Trentini 2016, pp.178-85.

The dialectical method, instead, has three main virtues. First, where the *endoxa* are selected properly, it draws on the bits of evidence that have presented themselves as evident to those who are knowledgeable. Second, dialectic provides an indirect proof of the first principle, when they prove to resists denial or refutation. Third, it accounts for the importance of the *endoxa* in Aristotle's treatment of philosophical problems and in his enquiry into the principles. There is little doubt that Aristotle makes reference to *endoxa* in his enquiries into the principles of science and in setting the philosophical problems. The scope and limits of the *endoxa*, nonetheless, are object of controversy. According to hardcore defender of the dialectical reading, *endoxa* seem to be the *alpha* and *omega* of the enquiry into principles. According to this reading, the principles are argued for *ex authoritate*.

The main shortcoming of the dialectical method with relation to the first point if that it ends up relying on arguments *ex authoritate*. The second point may secure a certain degree of stability of the results, but not the kind of stability derived from direct proof.

When applied to the enquiry into the principles of natural things pursued in *Phys.I*, the main contribution of the dialectical method is to recognise Aristotle's appeal to both the agreement among his predecessors in *Phys.I.4-6* (Owen-ish dialectical method) and to the analysis of common language in *Phys.I.7* (Wieland-ish dialectical method). This still does not amount necessarily to using either of these dialectical tools as cornerstones for argument. My claim is, in fact, that they do not, at least not unqualified *ex authoritate*.

First, we have to draw a difference between *Phys.I.4-6* and *Phys.I.7*. This difference is long acknowledged, but not appreciated in the right way. It has been lamented by Kelsey that scholars have too often proceeded to analyse *Phys.I.7*, overlooking the importance of *Phys.I.4-6* for the overall argument of *Phys.I*.[26] A tendency of scholarship has thus been to consider the latter block of chapters as merely dialectical (in a weak sense, namely as devoted to the discussion of the opinions of the predecessors), in opposition to *Phys.I.7*, where Aristotle would argue from his own point of view. It is clear, instead, that *Phys.I.4-6* contribute crucially to the overall argument

[26] Kelsey 2008.

of *Phys.I*. Thus, *Phys.I.4-6* cannot be merely dialectical.[27] Nonetheless, they depart from the opinions of the predecessors.

The status of *Phys.I.4-6* is thus in need of further clarification. The core of the difficulty of their status rests on the relation between argument (understood in general as a rational procedure yielding reliable results) and *endoxon*. I take the arguments of *Phys.I.5* as a case study, as *Phys.I.5* contains the most important reflection on the topic. I do not mean to reject the importance of *endoxa* for the enquiry into natural principles in *Phys.I*, but I think it is important to understand the relation between *endoxon* and argument, and, along with this, their respective roles and limits.

A reflection on the relation between *endoxon* and argument can be found in *Phys.*, I.5, 188b26-30. In the previous lines (188a30-b26), Aristotle has provided an argument showing that contraries are the principles of natural change. It is controversial how the argument works and what its limits are. What is certain is that Aristotle provides an argument using his own conceptual tools.[28] In the following lines, Aristotle reinforces his own rational argument by referring to the common opinion held by his predecessors that contraries are principles.

> *Phys.*, I.5, 188b26-30
>
> μέχρι μὲν οὖν ἐπὶ τοσοῦτον σχεδὸν συνηκολουθήκασι καὶ τῶν ἄλλων οἱ πλεῖστοι, καθάπερ εἴπομεν πρότερον· πάντες γὰρ τὰ στοιχεῖα καὶ τὰς ὑπ'αὐτῶν καλουμένας ἀρχάς, καίπερ ἄνευ λόγου τιθέντες, ὅμως τἀναντία λέγουσιν, ὥσπερ ὑπ' αὐτῆς τῆς ἀληθείας ἀναγκασθέντες.
>
> As I have stated previously, also most of the other [thinkers] – roughly – go along with me with relation to what I have claimed so far. For they claim that the elements and that which they call principles are the contraries, even though they fail to provide arguments [for their claim], but rather [endorse it] as if they had been constrained by truth itself.

In the passage, Aristotle first restates the *endoxon* opening ch.5, namely that principles must be identified with contraries. There are some points which are worth making.

First, the *endoxon* is not found as such in any of the predecessors and accepted, but rather abstracted from the individual opinions held by the predecessors. *Phys.I.6* (cf. §4.2.2.2.) clarifies that the agreement of the predecessors is not given as such, but rather gained by the philosopher who is able to see the unity beyond the single, partial truths grasped by each of the predecessors.

[27] Mansion 1961, p.41.
[28] Cf. §2.1-3.

Empedocles posited Love and Strife, Plato the Great and the Small, Anaximenes and other Physicists density and rarity. The *endoxon* is born, when the philosopher can surpass the limitations and particularity of the single received doctrines and see their similarity by virtue of a process of analogic abstraction.

Thus, even if we grant a strong argumentative role to the *endoxon*, this is nonetheless fruit of a process of rational abstraction and modification. This process is proper to the philosopher who sees beyond the partial truth of her predecessors and is capable of grasping the core of truth underlying the errors and singularity of each doctrine. Far from passively accepting an argument *ex authoritate*, using *endoxa* in the argumentative process entails a process of abstraction and reformulation of the received material.

Second, Aristotle reassures us that this opinion is true and that universal *consensus* applies to it by necessity in virtue of its truth. The idea that truth somehow imposes itself on thought is found, among other passages, in *Metaph.*, I.4, 984b8ff. A certain degree of self-evidence of truth seems to be implied in *Metaph.*, II.1, 933a30-b19: truth is here said to be easy to acquire and to be something which is not possible to miss completely (although it is difficult to grasp truth in detail). This passage shares more than one point with *Phys.I*, for truth is also said to be the effort of a community of men, each bringing a greater or smaller contribution towards the knowledge of what is most evident by nature. Moreover, the difference between knowledge of truth as a whole and in detail may find a parallel in the discussion of scientific method in *Phys.*, I.1, 184a16ff. Here, scientific knowledge is said to start from that which is more knowable for us (i.e. easier) and καθόλου (generically or known as a whole) to that which is less knowable for us (i.e. more difficult) and καθ' ἕκαστα (i.e. known in detail).

Hence, scientific progress in *Phys.I* does not amount to replacing older, fallacious theories with new, correct ones. Scientific progress rather coincides with gathering the truth that is contained in the older theories, but generically and lacking of conceptual distinctions, and to bringing it to rational certainty by virtue of finding the rationales for it and to clarity through analysis.

If this is right, neither is scientific progress independent from truthful *endoxa* nor does it identify with the mere repetition of *endoxa*. The question we must answer is: what allows scientific progress to take place, namely the passage from the generic truth glimpsed by everybody (who

knows) to the grasp of truth that is accurate in its details and pertains properly to each thing enquired that is into?

Far from stating the sufficiency of *endoxa* for the pursuit of truth, Aristotle laments (ll.28-29) that the doctrines of the predecessors – although true in their seminal common intuition – were assumed by these *without providing a reason*, or *argument* (λόγος). It is clear that he sees his endeavour in the previous lines of *Phys.I.5*, and in *Phys.I.6-7*, as providing arguments and digging out the rationale underlying for the *endoxa* gathered from his predecessors. Thus, Aristotle does not identify *endoxon* and argument: the passage rather states that, once an *endoxon* has been gained, one still has no argument claiming on rational grounds for the truth of this *endoxon*. Scientific progress rather requires *argument* in order to gain rational certainty, and argument does not identify itself with *endoxon*.

Now, what counts as an argument in *Phys.I*? I have excluded that *consensus* and authority in *Phys.I.4-6*, are arguments at all. What about the linguistic analysis pursued in *Phys.I.7*? As I have said, a long tradition around and about Wieland has identified *the* argument for positing the three principles (matter, form and privation) in the linguistic analysis. In analysing *Phys.I.7*, I show how *Phys.I.7* starts from evidence gathered from the analysis of common speech on change, but supports the data gathered by virtue of other kind of arguments than linguistic ones. These – provided that there is such a thing as a linguistic argument, that I strongly doubt – have at best the function of bringing to light the unconscious pre-comprehension of reality buried in the way in which one talks about reality. Same as for the abovementioned, more authoritative *endoxa*, the way in which change is spoken of may reveal a generic truth that is too evident to be missed altogether. Nonetheless, when it comes to arguing for this truth, Aristotle provides other kinds of arguments than linguistic ones.

It has been endorsed by Bolton that the arguments of *Phys.I* are empirical ones. Bolton's view is well argued, but still takes into account only part of the argument developed through *Phys.I.4-7*. Not only does Bolton's view fail to account for the role of dialectic and *endoxa* in *Phys.I.* Also, it fails to account for arguments that cannot, or at least should not, be interpreted as empirical ones.

In my analysis of the arguments of *Phys.I.5-7*, I grant great importance to a priori arguments. With this label, I mean arguments that are not based on collections of empirical data, but that rest either on other primary principles, for instance through the exclusion of the contradictory. Let us

consider the argument presented in *Phys.*, I.7, 190a33-b1 for the claim that there is always a substrate underlying change. It has been shown that what comes into being does so out of an opposite. Now, it is immediately clear that what comes into being does so also out of a substrate, for, if the contradictory where the case, we should admit the existence of non-enmattered opposite properties. This argument makes no reference to any a posteriori collection of data; rather, it is derived a priori from a cornerstone of Aristotle's metaphysics, namely from the impossibility that properties exist in absence of their bearer (substrate or matter).

Aristotle, occasionally states that he is arguing a posteriori. For instance, when he argues, in the lines following the abovementioned a priori argument, that everything that undergoes substantial change comes into being out of a substrate. In order to make his point, Aristotle collects a series of cases of coming into being and shows how, in each and every case, a certain substrate underlies the process of substantial change. Obviously, the argument is valid only under condition that the series of comings into being considered is exhaustive of each and every kind of coming into being. Even in this obvious case of a posteriori argument, nonetheless, Aristotle wants to extend a general truth that he had previously argued for with relation to change in general, namely that everything that changes, changes out of a substrate. This truth is argued for through an a priori argument (190a33-b1). Aristotle may feel that his argument for the substantial case does not need to be as strong as an a priori argument; rather, he can be content with the a posteriori analysis of several cases of coming into being. Thus, without wanting to understate the importance of a posteriori arguments in *Phys.I*, I believe that a priori arguments have the lion's share in Aristotle's argument for the natural principles.

0.5. From *Phys.I.4-6* to *Phys.I.7*. Past the aporia, towards the principles of substance.

It goes without saying that getting clear about the distinctions and details of a generic truth grasped without clarity entails or can entail a more precise specification and a degree of reformulation of the generic truth itself. Namely, if can make what is known generically not only clearer with relation to the details, but also more precise with relation to the whole. I show in what follows that the failure of the predecessors to account for substance and Aristotle's specific focus on it entail a modification of the generic *endoxon* employed in *Phys.I.4-6*. A main shift taking place in *Phys.I* is the passage from the enquiry into the principles of natural things in

general (*Phys.I.4-6* and part of *Phys.I.7*) to the enquiry into the principles of natural substances as what-has-come-into-being (*Phys.*, I.7, 190a31ff.) This passage exceeds the notorious and misleading distinction between *Phys.I.4-6* and *Phys.I.7* as, respectively, dialectic and non-dialectic (meaning that Aristotle would speak in his own voice).

It is clear that *Phys.I.7* relies on the arguments of *Phys.I.4-6*. Nonetheless, when the arguments for the principles of natural things are applied to the enquiry into natural *substances*, a certain degree of modification of the generic *endoxon* in *Phys.I.4-6* is necessary. I believe that this modification occurs in two main fields.

(1) In *Phys.I.4-6*, the relation between the principles (substrate and contraries) is understood according to a certain model of metaphysical predication, the non-substantial one: [29]

Coincidental metaphysical predication (CMP): S is H^+.

According to this model, the substrate S is a natural substance functioning as the bearer of the non-substantial, contrary metaphysical predicate (or property) H^+. With relation to priority, it is clear that S is prior to H^+, for S exists without H^+, but not the other way round.

From this constellation, the aporia on the number of principles of *Phys.I.6* arises. If what is a principle must be primary; if the candidates for principles are the contraries (*Phys.I.*5) and the substrate (*Phys.I.*6); if the substrate is prior to the contraries; then, it may seem that only the substrate has claim to qualify as a principle.[30]

To be sure, the aporia is presented by Aristotle as a "2 vs 3 principles" one (contraries alone vs contraries and substrate), not as a "2 vs 1" one (substrate vs contraries), as we might expect. This can be explained by considering the fact that the existence and necessity of a substrate is argued for, in *Phys.I.6*, on the basis that the claim of *Phys.I.5* is true, namely on condition that there are contrary principles. This having been assessed, the task required for the solution of the aporia on the number of principles amounts to showing either that the contraries are sufficient principles of

[29] A classical definition of metaphysical predication has been provided by F. A. Lewis (Lewis 2001, p. 247, n. 2): "metaphysical predication is a relation between items in the ontology: between a metaphysical subject, Socrates (say), and – not a predicate (a linguistic item), but – a predicable, man (say) or pallor, without quotation marks. This is in contrast with linguistic predication, where what is predicated is a linguistic item–a grammatical predicate."
[30] Cf. 3.3.2, Subargument 2 of Arg.2 of *Phys.I.6*.

natural things or that endorsing the existence of the substrate does not undermine the claim of the contraries to qualify as principles. This latter task is the one undertaked by Aristotle in *Phys.I.7*.

In deepening the level of analysis to the analysis of S into matter, form and privation, *Phys.I.7* introduces a different kind of metaphysical predication:

Substantial metaphysical predication: M is F^+; M is F^-.

The difference between the two kinds of predication is not explicitly stated, but it is quite clear that Aristotle does not believe that the priority-relation existing in the two kinds of predication are one and the same. In fact, Aristotle leaves unexplored whether form or matter has claim to substantiality and, therefore, to ontological priority.[31] Moreover, the solution of the aporia provided in *Phys.I.7* seems to drop altogether the aforementioned concerns related to priority.

The aporia of *Phys.I.6*, read in this way, may appear to be too thin for the solemn title that is bestowed upon it.[32] Much the other way round, the solution of the aporia on the number of principles entails the overcoming of the ontology of the *Categories* – based on the symmetry between logical and metaphysical predication, and thus on one single model on metaphysical predication, the non-substantial one – for a deeper level of analysis. This level includes the analysis into matter and form of the individual substance representing the subject of predication in the *Categories*. Or rather, in the case of *Phys.I*, of a particular case thereof, namely of individual *natural* substances.[33] The deepening of the level of analysis to substantial

[31] *Phys.*, I.7, 191a19-20: πότερον δὲ οὐσία τὸ εἶδος ἢ τὸ ὑποκείμενον, οὔπω δῆλον. "Nonetheless, it has not yet become clear whether substance is the form or the substrate."

[32] Cf. *Phys.*, I.6, 189b27-9, where Aristotle claims that ἀπορίαν ἔχει πολλήν with relation to the choice between either the two principles option or the three principles option.

[33] The relation between the *Categories* and *Phys.I* is long acknowledged. I do not want to commit myself to any particular view about the relation between the ontology of the *Categories* and the ontology of other parts of Aristotle's *Corpus*. What I assume on this topic, although far from being uncontroversial, can perhaps be shared by scholars without need of argument. First, that the *Categories* present an ontology and not only a linguistic analysis. Second, that the beings that the *Categories* calls substrates of coincidental properties include the natural things dealt with in *Phys.I*: this man, this tree, this dog…, namely the inventory of the natural substances. Third, that this analysis is less complex than the hylomorphic analysis pursued in *Phys.I* and other texts (which does not necessarily mean that the *Categories* are of earlier composition, as in Jaeger's influential reading). Four, that substance means chiefly, in the *Categories*, the subject of non-substantial logical/metaphysical predication. These same points are endorsed, if I am not wrong, by Furth (1988, pp. 13ff.), to whose work I refer for their defense. From what I have claim, it is clear that I am sceptical towards interpretations opposing the (allegedly) early ontology of the *Categories* to the (allegedly) mature ontology contained other works (for instance, if I understand correctly, Graham 1987). Nonetheless, as I said, taking an argumented position in this scholarly *titanomachia* lies both beyond the scope of this work and beyond my forces.

metaphysical predication is the founding stone of hylomorphism, to which *Phys.I* is an introduction.

(2) In *Phys.I.7*, moreover, Aristotle refines of the concept of opposition qualifying as a natural principle. In *Phys.I.4-6*, the kind of opposition employed is that of contrariety, the scope thereof does not include substances. In arguing for the principles of *change* of natural things, Aristotle presents an a priori argument showing that contraries qualify as principles, for they are the extremes defining the range within which change occurs per se.[34] Contraries identify a range for natural per se change; contradictories do not. For instance, white and smooth do not define a range. Instead, white and black qualify as the extremes of the range encompassing all colours that are intermediate between white and black. Thus, white and black are the principles of any change of colour, for they qualify as sources of change, and for they are primary with relation to their intermediates. Aristotle's argument is presented as universal. In defending the universality of this claim, Aristotle analyses several cases that seem to present an intuitive difficulty. Without presenting them as such, for the enquiry has not been set on substance yet, Aristotle tackles several cases of substantial opposites and tries to show that his model encompasses these as well. Thus, what is composed comes to be out of what is non-composed and what is joined comes to be out of what is not joined.[35]

Now, there is an intuitive problem. Namely, the substantial opposites of form and privation do not yield a range as contraries do. A favourite Aristotelian definition for privation is "contradiction in a subject", and, as we have seen, contradictories do not identify any range. A basic requirement for this seems to be that the opposites represent a certain determinate degree of a certain property and a certain determinate degree of the opposite property. Nonetheless, if form fulfils this requirement, privation does not seem to. In fact, the capacity to define a range seems to lie entirely on the side of the form, whereas privation is the mere lack thereof. If we were to imagine the structure of a non-substantial range and that of a substantial range, the latter may appear as a line stretching between two well-defined points (e.g. white and black). A substantial range, instead, is neither uncontroversially a stretch (for it is not clear whether there are intermediates between the form of man and the privation thereof) nor uncontroversially defined

[34] *Phys.*, I.5, 188a30-b8, cf. §2.1.
[35] *Phys.*, I.5. 188b8-23, cf. §2.2.

by two definite points (for privation is nothing but the absence and the contradictory of the form).

In *Phys.I.7*. the passage from contrariety to the substantial opposition of form/privation is realised smoothly and without explanations. It is clear that, once the enquiry has come to pivot around substance, the concept of opposition in play has to be broader than that of contrariety, in order to include natural substances. Nonetheless, the rationale underlying the position of contraries as principles of change *Phys.I.5* does not seem to extend to the case of substantial change.

Also in this case, the argument of *Phys.I* is more complex than scholars are prone to recognise. *Phys.I.5* (and *Phys.I.6* with it) is neither a dialectical discussion of the opinions of the predecessors nor does it contain the definitive arguments that Aristotle needs for the principles of natural substances. Rather, *Phys.I.5-6* contain arguments that Aristotle is ready to endorse within the conceptual framework of his predecessor's philosophy. Namely, in an enquiry that does not focus yet natural substances, and where the relation between the principles is the one dictated by coincidental metaphysical predication.

The passage from the opposition of contrariety to that of form/privation is necessitated, in *Phys.I.7*, by the shift of the enquiry to the principles of natural *substance*. It is clear that the argument supporting form and privation as principles is contained in *Phys.I.5*. Nonetheless, the extension of the concept of opposition to form and privation is not supported by the range argument of *Phys.I.5*. At best, *Phys.I.5* provides the analogical basis for endorsing form and privation, but not the definitive argument needed for it. We could think, in fact, that Aristotle may have a thought of this kind in mind:

> white/black: change of colour = smooth/rough: change of texture = form/privation: change of substance.

In the first two parts of the analogy, the first member is a couple of contraries capable to define a range, and the second member is a kind of non-substantial change, of which the couple of contraries are principles. In this scenario, form and privation may be said to be principles of substantial change by virtue of analogy with the previous, non-substantial cases, although the rationale supporting the non-substantial cases does not hold for the case of substantial change.

In conclusion, the shift towards the principles of substance provides the final premise in the justification of the claim that privation is a principle. At the same time, it poses the necessity to establish the internal relation among the principles, matter, form and privation, as well as their respective aetiological status. This is the task of the final section of *Phys.I.7*, which constitutes the crowning achievement of the enquiry of *Phys.I* and the object of my §§5.7-9.

1. CONTRARIES AS PRINCIPLES OF BEING. ON *PHYS.I.5*, ARGUMENT 1 (188a26-30).

1.0. Introduction.

In the present chapter, as in the following one, I analyse the arguments of *Phys.I.5* claiming for the doctrine that contraries are principles (C). My claim is that C is internally complex, since the concept of principle refers to two different, but partially overlapping, causal fields: being and change.

The complexity of the field determinacy of natural principles is present both in the arguments claiming for C in *Phys.I.5* and in the arguments in *Phys.*, I.6, 189a20-b3 claiming for the necessity of positing the substrate as a principle.

In *Phys.I.5*, Aristotle presents two different arguments for C. The first one (188a26-30) advocates that contraries are principles of being (ontological elements, or constituents) of natural things. The second one (188a30-b26) argues that contraries are principles of change of natural things. I analyse each of these arguments in, respectively, Ch.1 and Ch.2.

Similarly, *Phys.*, I.6, 189a20-b3 can be analysed into two arguments for the claim that the substrate is a principle, each of which endorsing a different causal field and addressing one of the arguments of *Phys.I.5*. I analyse these arguments in my Ch.3.

Before turning to the analysis of Arg.1 of *Phys.I.5*, I briefly deal with the delimitation of the argument and with its nature.

1.0.1. Where Aristotle's first argument for C starts and what it claims for.

Phys., I.5, 188a19-30

> Πάντες δὴ τἀναντία ἀρχὰς ποιοῦσιν οἵ τε λέγοντες ὅτι ἓν τὸ πᾶν καὶ μὴ κινούμενον (καὶ γὰρ Παρμενίδης θερμὸν καὶ ψυχρὸν ἀρχὰς ποιεῖ, ταῦτα δὲ προσαγορεύει πῦρ καὶ γῆν) καὶ οἱ μανὸν καὶ πυκνόν, καὶ Δημόκριτος τὸ πλῆρες καὶ κενόν, ὧν τὸ μὲν ὡς ὂν τὸ δὲ ὡς οὐκ ὂν εἶναί φησιν ἔτι θέσει, σχήματι, τάξει. ταῦτα δὲ γένη ἐναντίων· θέσεως ἄνω κάτω, πρόσθεν ὄπισθεν, σχήματος γεγωνιωμένον ἀγώνιον, εὐθὺ περιφερές. ὅτι μὲν οὖν τἀναντία πως πάντες ποιοῦσι τὰς ἀρχάς, δῆλον. καὶ τοῦτο εὐλόγως· δεῖ γὰρ τὰς ἀρχὰς μήτε ἐξ ἀλλήλων εἶναι μήτε ἐξ ἄλλων, καὶ ἐκ τούτων πάντα· τοῖς δὲ ἐναντίοις τοῖς πρώτοις ὑπάρχει ταῦτα, διὰ μὲν τὸ πρῶτα εἶναι μὴ ἐξ ἄλλων, διὰ δὲ τὸ ἐναντία μὴ ἐξ ἀλλήλων.
>
> And all [the predecessors] posited the contraries as principles: both those who made the All one and non-changeable (in fact, even Parmenides posited hot and cold as principles, and called them fire and earth) and those [who posited] the dense and the rare [as principles], and Democritus as well. [This latter posited] the full and the empty [as principles], and claimed that one of these is being, whereas the other one is non-being. Moreover, he [employed] position, shape and disposition. These are the genera of the contraries: up and down, before and behind [are species of/belong to] position; having-angles and lacking-angles, straight and curved [are species of/belong to] figure.
>
> Thus, it is evident that all [the predecessors] made, in some sense, the contraries principles. And this is reasonable, for the principles [b] must not be out of each other, [c] nor out of anything else, and [a] everything must be out of the principles. And the primary contraries fulfil these conditions: [c'] as they are primary, they are not out of anything else; [b'] as they are contraries, they are not out of each other.

In the introduction, I have already argued against the idea that *Phys.I* provides arguments by authority or *ex consensu sapientium*. In the present section, I want to contrast the view held by certain scholars[36] that 188a19-30 provides a homogeneous piece of argument claiming for C *ex consensu sapientium* and thus opposing to the real argument for C contained in 188a30-b26.

Against this view, I argue, first, that 188a19-30 contains an argument for C that is not merely dialectical; second, that 188a19-30 claims for C from a different perspective than the successive argument. As I have claimed, *Phys.I.5* presents two arguments for C under two different perspectives: Arg.1 (188a26-30) with relation to being, Arg.2 (188a30-b26) with relation to change.

[36] Charlton 1992 (1970), pp.65-6 and Ross 1936, pp.487-9 echoing Philoponus 2009, 110, 24-111, 8. Philoponus treats these lines as part of the argument *ex consensu* starting at the beginning of ch.5 and opposing to the argument "by reasoning" of 188a30-b26.

My first claim is that 188a19-30 does not constitute a unified block, but must rather be divided into two sections. The first one (188a19-26) is dialectical, for it exemplifies the *endoxon* exposed in *Phys.I.4* and recapitulated in the opening line of *Phys.I.5* ("all [the predecessors] posited the contraries as principles"). The second one (188a26-30) provides an argument for this *endoxon*.

The dividing line between the two sections, i.e. between *consensus* and argument is drawn in 188a26-27. These lines open with a slightly varied and more cautious (πως) repetition of the *endoxon*, followed by the sentence καὶ τοῦτο εὐλόγως and by another sentence introduced by γάρ. I believe that the most natural way of reading these lines is that they introduce an argument for the *endoxon* previously stated, which is exactly what 188b26-30 declares to be lacking (and to be in need of being provided) in the theories of the predecessors. At least three reasons support this view.

(a) the repetition of the *endoxon* in line 26 ceases to be redundant and acquires a stronger sense in the economy of the passage, if it is taken to introduce the argumentative aim of the lines which follow, namely if the γάρ clause introduces an argument for it.

(b) εὐλόγως is properly rendered by the English word "reasonable", which is well-suited to introduce an argument showing why the *endoxon* in line 26 is judged such. As Judson (forth.) points out, εὐλόγως is seldom used to connote views that Aristotle is not ready to support with arguments, whatever degree of plausibility he may attribute to them. Falcon and Leunissen (2015) have made the even stronger point that εὐλόγως normally introduces claims that Aristotle is willing to endorse.

(c) γάρ normally introduces an argument. It is therefore most likely that lines 27-30, introduced by γάρ, convey an argument for the fact that the *endoxon* presented in the previous passage is held by Aristotle reasonable.

In a nutshell, I claimed against Charlton *et all.* that there is nothing like a *consensus* argument in 188a19-30, but rather that Aristotle firstly gathers and states an *endoxon* which he holds true, and then (lines 27-30) provides an argument for it.

With relation to my second claim, I have mentioned the widespread view that difference between Arg.1 and Arg.2 is that between an argument by authority and a proper argument. Far

from lying only in the form of the argument, the difference between Arg.1 and Arg.2 rests, I believe, in what is argued for.

1.1. The condition of ontological simplicity (COS) and the suitability of primary contraries to fulfil it. On Arg.1 (188a27-30).

After the opening dialectical section showing that all predecessors endorsed C, Aristotle provides his first argument for C, or rather for a well-defined version of C, namely that the contraries are principles of natural things *with respect to their being or ontological composition*.

> *Phys.*, I.5, 188a26-30
>
> ὅτι μὲν οὖν τἀναντία πως πάντες ποιοῦσι τὰς ἀρχάς, δῆλον. καὶ τοῦτο εὐλόγως· δεῖ γὰρ τὰς ἀρχὰς [b] μήτε ἐξ ἀλλήλων εἶναι [c] μήτε ἐξ ἄλλων, καὶ [a] ἐκ τούτων πάντα· τοῖς δὲ ἐναντίοις τοῖς πρώτοις ὑπάρχει ταῦτα, [c'] διὰ μὲν τὸ πρῶτα εἶναι μὴ ἐξ ἄλλων, [b'] διὰ δὲ τὸ ἐναντία μὴ ἐξ ἀλλήλων.
>
> Thus, it is evident that all [the predecessors] made, in some sense, the contraries principles. And this is reasonable, for the principles [b] must not be out of each other, [c] nor out of anything else, and [a] everything must be out of the principles. And the primary contraries fulfil these conditions: [c'] as they are primary, they are not out of anything else; [b'] as they are contraries, they are not out of each other.

Arg.1 can be divided into two parts. In lines 27-8, Aristotle states three conditions for something to be a principle of being ([a-c]). These three conditions, taken together, form what I call the "condition of ontological simplicity" (COS). According to COS, P is a principle of R, if P is the simplest, most basic element out of which R is composed. I expand on COS in the next section.

In lines 28-30, Aristotle shows that primary contraries qualify as principles, for they fulfil all conditions of COS ([a-c]). I analyse this in §I.3.

To be precise, Aristotle only implicitly assumes, but neither explicitly states nor justifies, that primary contraries fulfil condition [a] of COS, namely that [a'] everything is composed out of primary contraries. I show in §I.3.1.1. that [a'] is an *endoxon*. My *Chapter 4* contains reflections on the possibility of identifying substance with contrariety.

1.2. The first part of Arg.1 (188a27-8). The condition of ontological simplicity for being a principle (COS).

As I have showed in §0.3.1, *Metaph.V.1* provides a basic notion of what a principle is. In a nutshell, P is a principle of R, if R φs out of P (source condition) and there is no Z out of which P φs (priority condition).

The variable φ is the placeholder for the kinds of causal action that the principle P performs on the result R. For example, for φ = change, we say that P is a principle of R's change, if P is that out of which R changes; for φ = being, we say that P is a principle of R's being, if P is that out of which R is.

I claim that *Phys.*, I.5, 188a27-8 provides three criteria for something (A and B) to be principle of [NT] natural things. As I read it, [a] corresponds to the source condition; [b, c] spell out the priority condition.

A and B are principles of NT, if

[a] [NT] φs out of A, B and C (source condition);

[b] A and B do not φ out of any other source C;

[c] A and B do not φ out of each other. ([b] and [c] = priority condition).

Several points are worth making.

First, *Phys.*, I.5, 188a27-8 defines the basic notion of principle on a plurality of principles, coherently with the aim of Arg.1, namely to argue that primary contraries are principles. This plurality is composed out of items that fulfil the source condition, but not the priority condition (C), and of items which fulfil both the source and the priority conditions (A; B). Only the latter items qualify as principles, for [NT] and C derive from them, but A and B neither derive from them, nor derive from each other.

Second, the role of [a] in Arg.1 is to select the set [S] including each and every source of [NT]. Nevertheless, being a source is not sufficient to qualify as a principle, for only *primary* sources are principles. [b-c] provide a criterion for distinguishing the subset of the primary sources [PS] (i.e. the subset of the principles) from the subset of the non-primary sources [NPS].

[b] states that: a certain source S^1 belongs to [PS], iff S^1 does not derive from any other source S^2. At first sight, [b] may seem to fulfil the task of isolating [PS] from [NPS] without any need for [c]. Nevertheless, it can be the case that S^2 derives from a plurality of PS's. Let us take the simplest case in which S^2 derives from a pair of sources, say A and B. [c] is necessary in order to clarify whether both A and B or just one of them belong to [PS], thus qualifying as a principle.

[c] states that, if it is the case that A and B are both sources of [NPS] and [NT], then both A and B belong to [PS] and are principles, for they do not derive from each other. Let us take the case in which B derives from A. In this case, B qualifies as a source, for it is that from which [NT] derives. Nonetheless, if B derives from A, B does not fulfil [c], and therefore does not qualify as a principle. Let us take the case in which NT's derive from A and B, but it is neither the case that A derives from B nor the case that B derives from A. This latter case is the one contemplated by [c]. According to this scenario, A and B both qualify as primary sources and therefore as principles, for both A and B are primary with relation to NT's and NPS's, but none of them is primary with relation to the other one. Thus, both A and B qualify as principles.

In conclusion, taken together, [b] and [c] spell out the priority condition for sources to qualify as principles. Thus, the sources A and B qualify as primary sources and principles, iff [b] A and B do not derive from any other source C, and iff [c] A and B do not derive from each other.

Third, lines 27-8 remain uncommitted with relation to the causal field of the principle (φ). They make use of the ἐκ-language ("P is a principle of R, iff R primarily ἐκ P") proper to the definition of principles, omitting the verb that qualifies the causal effect of the principle P with relation to its result R. This elliptical formulation seems to amount to this other one: "P is a principle of R, if P is that out of which R primarily φs", where φing (e.g. "being", "changing") designates the causal action of P with relation to R, namely the causal field of the principle φ. This basic notion of principle is as comprehensive as unspecific, for it leaves φ unspecified, and φ indicates the nature of the relation of source performed by P on R. In other words, the basic notion of principle offered in lines 27-8 is neutral with relation to the kind of causal action performed by P on R.

The comprehensiveness and lack of specificity of the basic notion of principle as a primary source provided in lines 27-8 enables it to be in play both in the second part of Arg.1 and in Arg.2 of *Phys.I.5*.

Fourth, in the second part of Arg.1 (188a28-30), φ is specified as "being", thus qualifying the basic notion of principle of the first part of Arg.1 into what I label as the *Condition of Ontological Simplicity* (COS). With this label, I want to capture the idea that P is a principle of being of R, if P is a primary (i.e. most simple) constituent of R. If P fulfils COS, then, P is a primary element (στοιχεῖον) of R, using a technical term that appears only once in *Phys.I* as a synonym of the general term principle.[37]

1.3. The second part of Arg.1 (188a28-30). How primary contraries fulfil COS.

In what follows, I analyse the three premises of Aristotle's argument for the claim that primary contraries fulfil the three conditions ([a-c]) of COS. In order for the argument to work, I assume that we have to add a hidden premise ([a']) corresponding to [a], in the same way as the premises [b'] and [c'] in 188a28-30 correspond, respectively, to [b] and [c]. As I understand it, Arg.1 unwinds through two steps.

The first step of Arg.1 (§I.3.1.) argues that contraries are that out of which natural things are composed ([a']). This amounts to showing that contraries fulfil the source condition for being principle, i.e. that contraries are that-out-of-which all natural things are.

The second step of Arg.1 (§I.3.2-3.) has the role of selecting as principles a specific subset within the set identified in the first step. This set includes the beings out of which all natural things are composed, namely the contraries. Within the set of the contraries, subarguments [b'] and [c'] have the function of selecting the subset of the primary contraries as the subset containing the contraries that qualify as principles, for all other contraries are composed out of them.

Taken together, [a-c] show that primary contraries fulfil COS and qualify as principles of natural things with relation to their being or ontological composition. Thus, Arg.1 argues for [C*] a narrower claim than [C] the *endoxon* extracted from the theories of the predecessors that contraries are principles of natural things.

[37] *Phys.*, I.1, 184a11.

Moreover, the claim argued for by Arg.1 (and Arg.2) of *Phys.I.5* must be stronger than the generic claim that [C*] the primary contraries are principles of natural things. In order for the aporia on the number of principles raisen at the end of *Phys.I.6* to be motivated, and according to *Phys.*, I.7, 191a15-6,[38] *Phys.I.5* must argue for the stronger claim:

[C**] the primary contraries are the *only* principles of natural things.

In the next section, I discuss which version of [a'] has the required strength to yield [C**].

1.3.1. The source condition of COS: [a'] all natural things are composed out of the contraries.

I claim that Arg.1 works on condition that [a'] is introduced as a hidden premise corresponding to premise [a] of COS. Premise [a] states what I have labelled as the source condition for principles of being, namely that P is a principle of R, if R is composed out of P. In arguing that contraries are principles of natural things, Aristotle must assume that:

[a'] (generically,) all natural things are composed out of the contraries.

Some points are worth making.

(1) The force of [a'] can be interpreted in at least two ways. Since Aristotle refrains altogether from formulating [a'], the discussion of its force is possible only by way of establishing the force of the conclusion of Arg.1. The weaker interpretation of [a'],

[a*] all natural things are composed out of the contraries, without being exhausted by the contraries,

in addition to [b', c'], yields the weaker conclusion that

[C*] the primary contraries are principles of natural things *non-exhaustively*.

For [a*] only claims that each and every natural thing has at least one component that is a contrary.

[38] *Phys.*, I.7, 191a15ff. summarises the line of argument stretching from *Phys.I.5* to *Phys.I.7*. Lines 15-6 recapitulate the argumentative scope of Args.1-2 of *Phys.I.5*: *Phys.I.5*: πρῶτον μὲν οὖν ἐλέχθη ὅτι ἀρχαὶ τἀναντία μόνον, "First, it has been said that the principles are only the contraries."

Although [a*] presents itself as plausible, the development of the argument on the principles of natural things through *Phys.I.4-7* may give preference to the stronger version of [a']:

[a**] all natural things are exhaustively composed out of the contraries.

In addition to [b', c'], [a**] yields the expected stronger conclusion [C**], according to which primary contraries are the *only* principles of natural thing. [a**], nonetheless, requires a stronger motivation than [a*] does.

(2) [a'] and its variations are far from being self-evident claims. Common observers, dependently on their own private experience and degree of knowledge, may analyse reality into this or that set of primary components. That they might agree on the claim that the components of reality are contraries, is questionable to say the least.

Aristotle does not mention the rationale for this view. The closer we may get to a motivation of [a**] is, I believe, that Aristotle treats it as an *endoxon* (cf. §I.3.1.1.)

(3) If [a**] is an *endoxon*, the question that must be asked is whether and how far Aristotle is ready to endorse it. If he is not, Arg.1 has the value a merely dialectical argument. If Aristotle is, at least to some extent, ready to endorse [a**], then Arg.1 must present at least some degree of plausibility (provided that the remaining premises are also either plausible or true).

Now, the result of Arg.1 is evidently assumed in *Phys.I.7* as a cornerstone for Aristotle's own doctrine of natural principles. Thus, Arg.1 must enjoy at least a certain degree of plausibility. This entails that Aristotle must be ready to endorse [a**], at least to some extent and on condition that [a**] undergoes a certain degree of refinement. I analyse the issue in *Chapter 4*.

1.3.1.1. [a**] as an *endoxon*.

In this section, I show that Aristotle believes that the first premise of Arg.1 ([a**]) is an *endoxon*. Out of several texts in which Aristotle attributes [a**] to his predecessors, I devote the following discussion to a passage of *Metaph.IV.2*, because it connects [a**] with the general claim that the contraries are principles.

The argument contained in *Metaph.*, IV.2, 1004b27-1005a13 argues, against sceptics of the possibility of metaphysics, that there is a single science inquiring into that-which-is in its entirety. A plausible reconstruction of the argument is the following:

> [1] all the things-that-are are (exhaustively) composed out of the contraries;
>
> [2] all contraries can be reduced to the primary contraries one/many and being/non-being;[39]
>
> [3] one and many are studied by the same single one discipline (for they are themselves contraries, and contraries are studied by the same single one discipline).[40] Therefore,
>
> [4] there is something as a single one discipline studying that-which-is in its entirety.

In other words: [1] the whole of reality can be reduced to contraries, for the contraries are the primary components of the whole reality; and [2] the contraries can be reduced to one/many and being/non-being, for all contraries are said with relation to one/many and being/non-being. And since [3] it is the case that each pair of contraries is studied by a single one discipline; and since one/many are contraries; it follows that there is a single one science studying one and many; and since the whole reality can be reduced to one and many, then [4] there is a single one discipline that studies reality in its whole.

According to my reconstruction of the argument, its first two premises should be understood in a robust, reductionist sense: [1] the whole reality is exhaustively composed out of contraries; [2] all contraries can be reduced to the primary contraries one/many and being/non-being. If [1] is not interpreted in a reductionist way, namely as claiming that contraries compose exhaustively the whole reality, then the argument seems to fail in demonstrating [4].

The crucial question about the validity of argument in *Metaph.*, IV.2, 1004b27-1005a13 concerns premise [1]. My main claim is that [1] is clearly presented by Aristotle as an *endoxon*. This does not entail that [1] is held as true by Aristotle. In fact, Aristotle's readiness to endorse [1], and consequently the validity of the argument of *Metaph.IV.2*, has been rejected by several

[39] Namely not as their synonymous genera, but analogically, i.e. in so far as every contrary is said with reference to one and many. Cf. *Metaph.*, IV.2, 1005a5ff., in which Aristotle probably refers to the relation of homonymy πρὸς ἕν.
[40] *Metaph.*, IV.2, 1004a9.

scholars, who have downplayed the argument of *Metaph.IV.2* as a merely dialectical one.[41] For the sake of brevity, I restrict my quotation of the Aristotelian text to premise [1].

> *Metaph.*, IV.2, 1004b29-33
>
> [1] [α] τὰ δ'ὄντα καὶ τὴν οὐσίαν ὁμολογοῦσιν ἐξ ἐναντίων σχεδὸν ἅπαντες συγκεῖσθαι· [β] πάντες γοῦν τὰς ἀρχὰς ἐναντίας λέγουσιν· οἱ μὲν γὰρ περιττὸν καὶ ἄρτιον, οἱ δὲ θερμὸν καὶ ψυχρόν, οἱ δὲ πέρας καὶ ἄπειρον, οἱ δὲ φιλίαν καὶ νεῖκος.
>
> [1] [α] And, roughly speaking, all [thinkers] agree that the things-that-are, and substance, are composed out of contraries; [β] for, at least, all [thinkers] claim that principles are contraries: some [claim that they are] odd and even, some hot and cold, some limit and limitless, some love and strife.

Premise [1] from the argument in *Metaph.*, IV.2, 1004b27-1005a13 can be divided into two claims. I take [α] to be equivalent to [a**] and to represent an *endoxon* drawn from the predecessors. On the face of it, [β] seems to some extent to better qualify [α] by way of stating that all predecessors made the contraries principles.

The compositional thesis of [α] is stated with a qualification (σχεδόν). This may be explained as a limitation of the universality of the claim (ROT: "nearly all thinkers"). I suggest that σχεδόν rather expresses Aristotle's caution in attributing [α] to his predecessors. I spell out my suggestion by analysing the relation between [α] and [β].

The relation between the compositional claim [α] and the claim about the principles [β] is not immediately clear. [β] is linked to [α] through the particle γοῦν, that expresses both limitation and inference.[42] The limitation expressed by γοῦν in [β] can be seen as matching the cautious σχεδὸν in [α]: Aristotle would ground his cautious compositional claim [α] on the less controversial claim that all predecessors posited the contraries as their principles. The causal meaning of γοῦν suggests that [β] may to some extent provide a proof for the compositional claim [α]. Aristotle may draw the inference that [α] all predecessors thought that everything is constituted out of contraries from [β] the evidence that all predecessors posited the contraries as principles.

This reading of the text, which hinges on the meaning of γοῦν, allows us to endorse two claims about [1].

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[41] For a collection and a discussion of passages in which Aristotle rejects [1], *see* Kirwan 1993, p. 85.
[42] LSJ: "Restrictive particle with an inferential force". Also, Denniston 1950, pp. 448ff.

First, Aristotle, to a certain extent, infers [α] from [β]. Aristotle starts from [β] the *endoxon* that the contraries are principles and traces back to the claim that [α] the contraries are the constituents of everything. A similar strategy can be found in Arg.1 of *Phys.I.5*, in which Aristotle starts from the *endoxon* "the contraries are principles" and further qualifies it in Arg.1 into a compositional sense, arguing that the contraries are principles of natural things, for they are the elemental components thereof. As in *Phys.I.5*, in *Metaph.IV.2*, the compositional thesis [α] specifies the claim [β] that the contraries are principles.

Second, the restrictive sense of the particle ("at least") may account for the caution with which [α] is expressed. [α] may be seen as Aristotle's own attempt to spell out the rather indeterminate claim [β] of his predecessors in a compositional way. Since [α] is Aristotle's own qualification of a general and vague [β], [α] is stated cautiously. In this connection, [β] is the *endoxon* clearly stated by the predecessors, whereas [α] is Aristotle's rationale for it.

In conclusion, *Metaph.*, IV.2, 1004b29-33 assesses that Aristotle believes that the claim that [a**] (natural) things are exhaustively composed out of the contraries is an *endoxon*. Moreover, [a**] represents a qualification of the indeterminate claim that [β] the contraries are principles as a claim concerning the being and ontological composition of natural things. Similarly, Arg.1 of *Phys.I.5* qualifies the general and vague *endoxon* that contraries are principles of natural things with relation to being or ontological composition.

1.3.2. The priority condition of COS: first subargument. [b']: The primary contraries are not out of other contraries, for they are primary.

[b'] and [c'] spell out the priority condition of COS. They show that, among the contraries, the primary contraries are that-out-of-which the other contraries are constituted. Since the primary contraries fulfil both the source and the priority condition, they qualify as the principles of natural things with relation to their being.

The first subargument [b'] claims that the primary contraries are principles, for they are prior to the other contraries. Let us consider the set [C] including all contraries. [C] fulfils condition [a] for being principle of the set of natural things [NT], for all natural things are constituted out of at least one member of [C]. Now, [C] includes at least two subsets: [PC], i.e. the subset including

primary contrary pairs ([PC^+ and PC^-]), and [IC], i.e. the subset including all intermediate contraries. A contrary belongs to [PC], if there is no further member of [C] out of which [PC] is composed, and if there is at least one member of [NT] that is composed out of it. The latter condition can occur either directly (when [NT] is composed out of at least one [PC]) or indirectly, i.e. by virtue of [NT] being composed out of a member of [IC], which is in turn composed out of a member of [PC]. Instead, a member of [C] belongs to [IC], if it is composed out of at least one member of [PC].

Summing up, the relation between primary contraries, intermediate contraries and natural things can be portrayed according to two scenarios. First scenario: [NT] is composed out of [IC], and [IC] is composed out of [PC]. If this is the case, [PC] is the primary constituent both of [IC] and of [NT]. Second scenario: [NT] is composed out of [PC], and [PC] is the primary constituent of [NT]. According to both scenarios, [PC] qualifies as principle, for it fulfils both the source and the priority condition of COS.

The relation between primary/intermediate contraries and natural things can be portrayed according to the following Russian doll-like model and is found frequently in the Aristotelian *Corpus*. The biggest and most external Russian doll represents [NT]. [NT] is composed out of a certain number of intermediate sets [IC^1], [IC^2], [IC^3], which are such that [IC^1] is composed out of [IC^{2-3}] and [IC^2] is composed out of [IC^3]. The intermediate sets [IC^{1-3}], taken together, constitute the set of intermediate contraries [IC] composing [NT]. In turn, [IC] is composed out of the most internal and smallest Russian doll, i.e. out of the set of the primary contraries [PC]. As [NT] is composed out of [IC], and [IC] is composed out of [PC], then [NT] is composed out of [PC]. Therefore, [PC] has better claim than [IC] to qualify as ontologically simple, and thus to qualify as a principle.

One of the numerous examples of the Russian doll-like model with relation to composition out of contraries can be found in *Metaph.VIII.4*, where Aristotle draws a distinction between the concepts of remote and proper matter. The general claim of *Metaph.*, VIII.4, 1044a15-24 is that natural things in some sense have the same remote matter and in some other sense have a proximate matter that is proper to each kind of natural things. For example, two different natural,

contrary things (the phlegm and the bile)[43] can have different proximate matters: the proximate matter of the phlegm is the sweet stuff; the proximate matter of the bile is the bitter stuff. The sweet stuff and the bitter stuff are the contraries out of which the phlegm and the bile are respectively composed, and therefore their respective proximate matter. The sweet stuff has, in turn, a further proximate matter out of which it is composed, namely the fatty stuff. The line of the phlegm (the phlegm, the sweet stuff and the fatty stuff) and the line of the bile (the bile, the bitter stuff) have in turn a common matter out of which they are composed and which represents the remote matter of both the phlegm and the bile, namely water.

> *Metaph.*, VIII.4, 1044a15-24
>
> Περὶ δὲ τῆς ὑλικῆς οὐσίας δεῖ μὴ λανθάνειν ὅτι εἰ καὶ ἐκ τοῦ αὐτοῦ πάντα πρώτου ἢ τῶν αὐτῶν ὡς πρώτων καὶ ἡ αὐτὴ ὕλη ὡς ἀρχὴ τοῖς γιγνομένοις, ὅμως ἔστι τις οἰκεία ἑκάστου, οἷον φλέγματος [ἐστι πρώτη ὕλη] τὰ γλυκέα ἢ λιπαρά, χολῆς δὲ τὰ πικρὰ ἢ ἄλλ'ἄττα· ἴσως δὲ ταῦτα ἐκ τοῦ αὐτοῦ. γίγνονται δὲ πλείους ὕλαι τοῦ αὐτοῦ ὅταν θατέρου ἡ ἑτέρα ᾖ, οἷον φλέγμα ἐκ λιπαροῦ καὶ γλυκέος εἰ τὸ λιπαρὸν ἐκ τοῦ γλυκέος, ἐκ δὲ χολῆς τῷ ἀναλύεσθαι εἰς τὴν πρώτην ὕλην τὴν χολήν. διχῶς γὰρ τόδ'ἐκ τοῦδε, ἢ ὅτι πρὸ ὁδοῦ ἔσται ἢ ὅτι ἀναλυθέντος εἰς τὴν ἀρχήν.
>
> On the topic of material substance, we must notice that even if everything does come from the same primary stuff, or stuffs, and even if it is the same matter that functions as a principle of the things that come into being, nevertheless there is a different matter appropriate to each. Thus, the matter appropriate to phlegm is the sweet or fatty stuff, while the matter appropriate to bile is the bitter stuff or something else; but these latter perhaps come from the same stuff. The same thing will come to have several matters when one is the matter of the next. Thus, phlegm may come from what is fat and what is sweet, if fat itself comes from what is sweet. Whereas, phlegm comes from bile in virtue of the resolution of the bile into its primary matter. For one thing may come from another in two ways: either because the one is reached via the other; or because the other is resolved into its principle. [Transl.: Bostock 1994, modified]

The reconstruction of *Metaph.*, VIII.4, 1044a15-24 I have presented raises several interpretative problems.

(1) As Bostock notices, it is not clear whether Aristotle talks about the matter out of which something is composed or of the matter out of which something comes to be. On the face of it, something can come out of a matter M at t^1 without being composed out of M at t^2, if M does not persist through the process of change out of M. The difference between these two kinds of matter

[43] For phlegm and bile as contraries, cf. *Pr.*, I.29, 826b25-9, where bile is qualified as (essentially) hot and phlegm as (essentially) cold. The fact that the qualies of being hot and of being cold are essential to, respectively, bile and phlegm is a necessary assumption of the argument developed.

becomes clearer when we ask what the matter of Socrates is. On the one hand, Socrates comes out of the menses; on the other hand, the proximate matter of Socrates is his own human body. The latter qualifies as the matter out of which Socrates is and has come to be. The former certainly qualifies as matter out of which Socrates has come to be, but does not qualify as uncontroversially as the matter out of which Socrates is, for Socrates does not seem to be composed out of the menses. The menses, in fact, do not seem to persist as such through the process of generation of Socrates. This has led to a widespread scepticism about the idea that matter persists through change.[44]

Applying this problem to the example in *Metaph.VIII.4*, if it is not the case that matter persists through change, then it is not the case that IC is composed out of PC, but it is only the case that IC comes to be out of PC. Concerning remote matter (PC), which appears to be the decisive point at stake, it is not clear how far we can endorse the claim that remote matter persists, and therefore that remote matter is contained in the proximate matter. Water does not seem to be a constitutive element of phlegm and bile more than menses are with relation to Socrates.

I analyse the issue of the persistence of the substrate through substantial change in §5.6, where I conclude that, in every substantial change, the substrate persists at least in a weak sense. Therefore, *Metaph.VIII.4* presents a case in which contraries are composed out of other contraries.

(2) Aristotle elsewhere excludes that matter belongs to the set of the contraries [C]. Nevertheless, it is hard to reject the intuition that the sweet stuff and the bitter stuff are most likely to qualify as contrary kinds of matter, in so far as each of them is in itself essentially sweet and bitter. Similarly, water is defined in *GC.II.3* as the kind of matter that is essentially qualified by the possession of the contraries cold and wet out of the two fundamental contrarieties of cold/hot and wet/dry. In virtue of being in itself cold and wet, water opposes completely to fire, that is qualified by the remaining contraries of each pair (hot and dry); and partially to the remaining elements (each in virtue of only one contrary). The contrariety of hot/cold and dry/wet qualifies essentially the sublunary elements, and the contrariety of each sublunary element to the others (complete or partial) is the basis of their reciprocal interaction. Therefore, the relation between matter and contrariety is not one of neat alterity, as Aristotle sometimes depicts. It is

[44] Cf. §5.6.

one of the tasks undertaken by Aristotle in solving the aporia raised in *Phys.I.6* to clarify the relation between contrariety and matter or substrate.

In conclusion, I believe that we have good reasons for interpreting the two series presented in *Metaph.*, VIII.4, 1044a15-24 (water-fatty stuff-sweet stuff-phlegm; water-bitter stuff-bile) as series in which: (1) each member belonging to the same series is composed out of its preceding member(s); (2) each member is a contrary.

Summing up subargument [b'], since [PC] and [IC] are the sets of contraries out of which [NT] is composed, and since [PC] is prior to [IC] with relation to composition (for [IC] is composed out of [PC]), then [PC] qualifies as principle.

Nonetheless, the twofold nature of contrariety (i.e. the fact that contraries come in pairs) makes [b'] still non-sufficient to spell out the priority condition. In fact, [PC] contains two further subsets of primary contraries, [PC^+] and [PC^-], respectively including the positive and the negative members of each pair of primary contraries. Now, we may wonder whether [PC] in its whole or either [PC^+] or [PC^-] fulfils the priority condition. The second subargument for the claim that primary contraries fulfil the priority condition ([c']) is devoted to assessing this issue.

1.3.3. The priority condition for COS: second subargument. [c']: The primary contraries are not out of each other, for they are contraries.

I claim that the second subargument [c'] purports to show that natural principles cannot be further narrowed down to a subset of [PC] that is prior to [PC].

As a matter of fact, Aristotle believes that each member of every contrary pair is analogically one with one member of another contrary pair. Each member of each contrary pair is in fact either positive or negative. If we consider the contrary pairs of white/black, hot/cold and musical/unmusical, the former member of each contrary pair is positive, whereas the latter one is negative. The members of [C] (and thus of [PC]) can be thus divided into two columns (συστοιχίαι) of analogical terms, thus generating two further subsets of [C]: [C^+] and [C^-]. Thus, the set [PC] identified by [b'] as the set of the principles of being of natural things, is composed

out of two further subsets: [PC^+], including the positive member of each primary contrary pair; [PC^-], including the negative member of each primary contrary pair.

In this scenario, I believe that [c'] has the role of showing that the set of the principles cannot be further narrowed down to either [PC^+] or [PC^-]. Rather, [PC^+] and [PC^-] are shown to be co-primary; therefore, they both qualify as principles. Thus, the whole set of the primary contraries [PC] must be taken to identify with the set of the natural principles.

If my reconstruction is correct, [c'] claims that it is neither the case that [PC^+] is composed out of [PC^-] nor the case that [PC^-] is not composed out of [PC^+], for [PC^-] and [PC^+] are contrary to each other. How are we to understand the argument? I believe that a promising way of understanding the argument is that it may pivot on one property which is shared by all exclusive opposites, namely incompossibility.[45] In short: A is the exclusive opposite of B, if A and B cannot both exist at the same time t in the same subject S.

Let us consider a pair of primary contraries $PC1^+$ and $PC1^-$. As $PC1^+$ and $PC1^-$ are exclusive opposites, $PC1^+$ and $PC1^-$ are incompossible. Now, if $PC1^+$ were composed out of $PC1^-$, then there would be a time in which $PC1^+$ and $PC1^-$ coexist. But this is impossible, for $PC1^-$ and $PC1^+$ cannot coexist at any time. Therefore, it is evident that PC^+ cannot be composed out of $PC1^-$ (nor can $PC1^-$ be composed out of $PC1^+$).

Provided that my attempt to understand the role of [c'] in Arg.1 meets Aristotle's intentions, some objections and problems can be raised.

First, some interpreters have seen a contradiction between [c'] and the main claim of Arg.2 of *Phys.I.5* (188a30-b8), in which Aristotle argues that contraries (C^+ and C^-) are principles, for every C^+ γίγνεται ἐκ its corresponding C^-, and vice versa. Thus, implicitly, also every PC^+ γίγνεται ἐκ its corresponding PC^-. A strategy of interpreters for solving this alleged inconsistency hinges on the hypothesis that the preposition ἐκ is used in Arg.1 and Arg.2 in two different meanings.[46] I have argued that the difference between the two arguments is rather related to a

[45] *Metaph.V.10*; *Cat.10*. Incompossibility is shared by all kinds of opposites, excluding relatives. Namely by contradictory and contrary pairs, as well as by *habiti* and their corresponding privations.
[46] Judson (unpublished paper). Judson must nevertheless admit that the meaning of ἐκ that he wants to be in play in Arg.1 cannot be found where we most reasonably expect to find it, namely in the glossary of the meanings of ἐκ in *Metaph.V.24*.

difference in the causal field. There is no contradiction between the claims that primary contrary *are* not out of each other (Arg.1, [c']), but *come to be* out of each other (Arg.2).

Second, the role I have attributed to [c'], namely to demonstrate that both [PC^+] and [PC^-] qualify as principles of natural things, seems to contradict one of Aristotle's strategy of reducing the number of the principles of natural things from three to two. In *Phys.*, I.7, 191a5-7, Aristotle that the triad of principles reached in *Phys.I.7* (substrate, form ([F^+]⊃[PC^+]) and privation ([F^-]⊃[PC^-])) can be reduced to the dyad of substrate and form, for privation can be reduced to form. In fact, every privation is no more than the absence of its corresponding form. The claim of [c'] in Arg.1 of *Phys.I.5* and that of *Phys.*, I.7, 191a5-7 appear difficult to harmonise, and I confine myself to flag the issue.

Third, incompossibility rules out that A and B, if they are contraries, can ever exist *actually* at the same time t and in the same subject S. This is not sufficient to exclude that A and B may inhere potentially in the same subject S, or that A may inhere actually and B potentially in S (or the other way round). As a matter of fact, appealing to incompossibility does not seem to be sufficient to exclude that any kind of composition (potential composition, for example) is in play between [PC^+] and [PC^-].

This may lead us to either look for a new reconstruction of [c'], or to assess that [c'] is not an argument that Aristotle would seriously endorse. I believe that none of the two options should be pursued. I believe that we should not look for a different reconstruction of [c'], for the reconstruction proposed works at least with relation to the stage of the argument of *Phys.I* reached so far. First, potentiality and actuality do not belong to the conceptual tools employed in *Phys.I*. Secondly, this objection makes use of the concept of substrate (S), which has not yet been introduced at this stage of the argument.[47] At the stage of the argument we have reached so far, C^+ and C^- (A and B) are contrary natural things (*see* the previous footnote). Thus, if C^+ were composed out of its contrary C^-, either the principle of non-contradiction would be infringed or C^+ would be destroyed by the presence of its contrary. Therefore, reciprocal composition between C^+ and C^- is impossible.

[47] The concept of substrate is mentioned before *Phys.I.5* only in the dialectical discussion of the opinions of the predecessors of ch.4. It is the task of *Phys.I.6* to argue for the claim that the substrate is a principle of natural things, and the task of *Phys.I.7* to show that C^+ (and F^+) and C^- (and F^-) are actually compounds of a matter M (or of a substrate S) and a contrary (or opposite) feature, e.g MF^+/MF^-.

1.4. Conclusions on Arg.1.

I have claimed that *Phys.*, I.5, 188a26-30 presents an argument for the *endoxon* C that the contraries are principles of natural things. Arg.1 hinges on the basic notion of principle, specifying it with relation to being or ontological composition into the *Condition of ontological simplicity* (COS). The intuition behind COS is that A is a principle of being of B, iff B is composed out of A (source condition), and A is not composed out of C (priority condition).

The rationale supporting the claim that the primary contraries fulfil the source condition is the *endoxon* that [a'] the primary contraries are the basic components of reality. The force of the claim is in need of discussion. I have shown that, in order for the aporia on the number of principles in *Phys.I.6* to arise, the result of Arg.1 must be that [C**] the primary contraries are the *only* principles of natural things. In order for Arg.1 to yield [C**], we need a stronger version of [a'], namely [a**] the primary contraries are the only components of reality.

The priority condition is spelled out by two further arguments [b'-c'] claiming that the primary contraries are not composed out of any other contrary, [b'] they are primary. Since the set of the primary contraries can be divided into the two columns of positive and negative primary contraries, a doubt arises whether one of these columns qualifies as a principle rather than the set of the primary contraries as a whole. [c'] argues that none of the two subset is composed out of the other one, for they are contrary. It is possible that the argument hinges on the incompossibility of the contraries.

In conclusion, Arg.1 shows that [C**] the primary contraries are only principles of being of natural things, for they [a**] are the only components of natural things (source condition), and [b'-c'] there is no further component of them (priority condition).

2. CONTRARIES AS PRINCIPLES OF CHANGE. ON *PHYS.I.5*, ARGUMENT 2.

Arg.2 of *Phys.I.5* (188a30-b26) claims that contraries are principles of natural things with relation to change. As in the case of Arg.1, I divide Arg.2 into two argumentative steps. The first step argues that the contraries and their intermediates fulfil the source condition for qualifying as principles of change, for they are that-out-of-which natural change occurs (cf. §2.1-2.) The second step refines the claim of the first one, concluding that, if both contraries and their intermediates are sources of natural change, only contraries fulfil the priority condition and qualify as principles, for the intermediates lack priority (cf. §2.3.)

The conclusion of Arg.2 is further confirmed through a survey of the theories on natural change held by the predecessors (188b26-189a10; cf. §2.4.) This survey is hardly what may be called an argument *ex autoritate*, for Aristotle makes clear through the words ἐπὶ τοῦ λόγου that his argument starts in 188a30. Rather, the function of this section is both to provide external support for the argument developed in the previous section, and to pinpoint the difference between Aristotle's and his predecessors' principles.

2.1. On *Phys.I.5*, Arg.2. Contraries as principles of change of natural things. The source condition.

The aim of Arg.2 of *Phys.I.5* is to identify the principles of change of natural things. This amounts to finding the primary sources out of which and into which (τὸ ἐξ οὗ/τὸ εἰς ὅ πρῶτον) natural things come to be in a proper sense. I analyse this endeavour into two conceptual steps, corresponding to the source condition and to the priority condition.

Spelling out the source condition for change is accomplished in two steps. First, change occurring by nature (πέφυκεν) or natural change must be distinguished from coincidental change or change occurring by chance. Second, the enquiry must turn to the identification of the principles of natural change, for they coincide with the principles of natural things with respect to change.

This identification can be gain theoretical justification from the following considerations. First, coincidental change presents no regularity and no definite kind of principle. Natural change,

instead, presents the regularity provided by having a definite kind of beings as principles, namely the contraries and their intermediates. Coincidental change occurs between any two sources, regardless of their reciprocal relation. Natural change occurs between two sources, on condition that they are either contraries or intermediates between contraries. Second, the principles of coincidental change are themselves coincidental to the principles of change occurring by nature. Thus, coincidental change is second to and dependent on natural change.

> *Phys.*, I.5, 188a30-b8
>
> [1] ἀλλὰ δεῖ τοῦτο καὶ ἐπὶ τοῦ λόγου σκέψασθαι πῶς συμβαίνει. [2] ληπτέον δὴ πρῶτον ὅτι πάντων τῶν ὄντων οὐθὲν οὔτε ποιεῖν πέφυκεν οὔτε πάσχειν τὸ τυχὸν ὑπὸ τοῦ τυχόντος, οὐδὲ γίγνεται ὁτιοῦν ἐξ ὁτουοῦν, ἂν μή τις λαμβάνῃ κατὰ συμβεβηκός· [2.1.] πῶς γὰρ ἂν γένοιτο λευκὸν ἐκ μουσικοῦ, πλὴν εἰ μὴ συμβεβηκὸς εἴη τῷ μὴ λευκῷ ἢ τῷ μέλανι τὸ μουσικόν; ἀλλὰ λευκὸν μὲν γίγνεται ἐξ οὐ λευκοῦ, καὶ τούτου οὐκ ἐκ παντὸς ἀλλ' ἐκ μέλανος ἢ τῶν μεταξύ, καὶ μουσικὸν οὐκ ἐκ μουσικοῦ, πλὴν οὐκ ἐκ παντὸς ἀλλ' ἐξ ἀμούσου ἢ εἴ τι αὐτῶν ἐστι μεταξύ. [2.2.] οὐδὲ δὴ φθείρεται εἰς τὸ τυχὸν πρῶτον, οἷον τὸ λευκὸν οὐκ εἰς τὸ μουσικόν, πλὴν εἰ μή ποτε κατὰ συμβεβηκός, ἀλλ' εἰς τὸ μὴ λευκόν, καὶ οὐκ εἰς τὸ τυχὸν ἀλλ' εἰς τὸ μέλαν ἢ τὸ μεταξύ· ὡς δ' αὕτως καὶ τὸ μουσικὸν εἰς τὸ μὴ μουσικόν, καὶ τοῦτο οὐκ εἰς τὸ τυχὸν ἀλλ' εἰς τὸ ἄμουσον ἢ εἴ τι αὐτῶν ἐστι μεταξύ.
>
> [1] But it is necessary to examine how this [that contraries are principles] results also according to the [following] argument. [2] Let us first assume that, among all beings, no-one either acts or suffers action by nature in such a way that any chance thing [acts on or suffers action] from any chance thing; also, nothing comes to be anything whatsoever out of anything whatsoever; this, of course, provided that one does not mean [acting, suffering action and coming to be] in a coincidental sense. [2.1.] For, how would white ever come to be out of musical, if not in the case in which the musical is coincidental to the non-white or to the black? Rather, white comes to be out of non-white; and not out of [non-white] in general, but rather out of black or the intermediates [between white and black]. And musical out of non-musical; only, not out of [non-musical] in general, but out of unmusical and out of the intermediates [between musical and unmusical] (provided that there are any). [2.2.] Also, nothing ceases to be into the first chance thing [or: nothing ceases to be primarily into any chance thing]; for instance, the white does not cease to be into the musical, if not in a merely coincidental sense; rather, [the white] ceases to be into the non-white, and not into any chance [non-white], but rather into the black or into the intermediates [between white and black]. In the same way, the musical ceases to be into the non-musical; this [the musical] [does not cease to be] into any chance [non-musical], but rather into the unmusical and the intermediates (provided that there are any).

The scope of the text is to clarify what values of A and B enjoy the right reciprocal relation R that enables natural change to occur. The result of the argument, as I reconstruct it, is that this

relation is a relation of reciprocal difference proper to the contraries. Thus, the source condition of natural change (SC^{nc}) is grounded on the relation of difference or contrariety.

For the sake of clarity, in analysing the source condition, I will not specify every time that a further condition related to time must be fulfilled as well. Namely, that A and B must always occupy two different instants in time t^1 and t^2. The language used by Aristotle in dealing with the conditions of change (ἐξ A … εἰς B) implicitly expresses this time requirement. Since my study concerns the source condition, I will leave the time constrain aside.

Our passage can be divided into three main sections.

[2] distinguishes natural change from coincidental change with relation to their respective sources. A and B qualify as sources of coincidental change,[48] iff A and B are any chance A and B whatsoever, say H^+ and G. H^+ and G are two chance items that do not enjoy any determinate reciprocal relation.

[2.1.] and [2.2.] specify the condition under A and B qualify as sources not of coincidental, but rather of *natural* change. This is accomplished by considering two cases of natural change: [2.1.] coming to be (γίγνεσθαι); and its opposite, [2.2.] ceasing to be (φθείρεσθαι).[49]

A and B qualify as sources of natural change, iff they are not any two chance items, but rather two items enjoying a relation of reciprocal difference, i.e. of contrariety. Namely, iff A and B coincide with H^+ and H^-.

In what follows, I spell out the source condition for natural change (§2.1.1.) and the source condition for coincidental change (§2.1.2.).

[48] The rendition closer to original would be "A acts on or suffers action from B coincidentally". I do not believe that the use of elsewhere technical terminology such as ποιεῖν/πάσχειν is here loaded with any special, technical meaning. I assume that ποιεῖν/πάσχειν mean a general relation of change between A and B.

[49] The terms γίγνεσθαι and φθείρεσθαι in [2.1-2.] should not be understood in their technical sense of (substantial) generation and corruption, as the distinction between substantial change and non-substantial change is introduced only in *Phys.I.7*. They should rather be understood as referring to, respectively, the kind of change occurring from A to B and its backward change occurring from B to A.

2.1.1. The source conditions for natural change (SC^{nc}).

I claim that sections [2.1.] and [2.2.] of *Phys.*, I.5, 188a30-b8 state two conditions that must be fulfilled in order for natural change to occur between two items A and B. These conditions concern the reciprocal relation R between two items A and B.

The first condition prescribes that, in order for change between A and B to occur, A and B must coincide with the contradictories A and non-A (¬A).

The second condition prescribes that, in order for natural change between A and B to occur, A and B must coincide with a particular case of A/¬A, namely with the contraries H^+ and H^-.

The rationale of these two claims is not provided in *Phys.I.5*. In the following two sections, I try to show how the first and the second condition for change express two essential features of change.

The first feature (§2.1.1.1.) is so self-evident that it sounds like a platitude. If A undergoes change, then A cannot be there any more, once the process of change is accomplished. If A at t^1 undergoes change, then at t^2 ¬A is.

The second feature (§2.1.1.2.) is less evident and less of a platitude than the first one. Nonetheless, it may be reasonably recognised to be essential to change. We have a better chance to make it clear by using the language of ποιεῖν/πάσχειν employed in 188a32-3. Two completely unrelated items such as A and ¬A do not have enough in common to act or suffer reciprocally. In order for action and passion between A and B to be possible, there must be a certain degree of similarity between A and B. Intuitively, if A has nothing in common with B, A cannot not act on or suffer from B. Thus, since change is a particular case of ποιεῖν/πάσχειν, in order for change to occur, there must be a certain degree of similarity between the starting point (at t^1) and the end point (at t^2) of change. The radical alterity between two completely alien items such as two contradictory items is just too big to be bridged and yield change.

2.1.1.1. First (necessary and non-sufficient) source condition for natural change. The otherness condition.

On an intuitive understanding of change, a certain item A has undergone change, if it is A at t^2 from having been ¬A at t^1 (where $t^1<t^2$). Only if this is the case, we say that ¬A has undergone change into A. I label this requirement for change *otherness condition*, for it states that, in order for change to occur, the sources of change A and B must stand in a relation of reciprocal otherness. A and B qualify as sources of change, if A is other than B (and B is other than A, as otherness is a transitive relation). With the expressions "being other than" and "otherness", I mean a relation between two items A and B in which, if A is other than B, then B is ¬A.

The otherness condition is the most generic condition for natural change and is necessary for A and B to qualify as sources of natural change. Let us assume that A occupies the time slot t^1. Let a certain stretch of time pass and check the time slot t^2. If t^2 is still occupied by A, then no natural change has occurred. If, on the contrary, t^2 is occupied by ¬A, then natural change has occurred.

The otherness condition does not entail any positive determinacy of the end point of change B into which A has changed at t^2. What the otherness condition prescribes is rather a negative criterion for the identification of the sources of natural change. Therefore, the otherness condition cannot be sufficient to positively qualify the relevant relation in which the sources of natural change must stand.

A major endeavour of our text is to distinguish between natural (per se) and coincidental change with relation to their respective sources. The otherness condition, being merely negative, cannot serve this scope by positively distinguishing the sources of natural change from the sources of coincidental change.

Nonetheless, it is possible that the otherness condition is instrumental to this distinction by virtue of applying in different ways to each kind of change or by virtue of applying to only one kind of change and not to the other. I analyse two options. First option: the otherness condition is necessary and sufficient with relation to coincidental change, but only necessary with relation to natural change. Second option: the otherness condition is necessary only for natural change, but irrelevant for coincidental change.

The first option gains some sort of likeliness from a *prima facie* reading of the text. Let us consider the case of coincidental change as it is presented in [2]. It may seem that, in order for A to change coincidentally into B, no other requirement needs to be fulfilled by B, if not that B is other than A. In fact, any chance A can be said to change into any chance B, provided that A≠B. For instance, let us consider the case in which white coincidentally changes into smooth, or 3-meters-long coincidentally changes into into asleep. Apparently, in order for each of these end points of change (smooth and asleep) to qualify as end points of coincidental change with relation to the starting points (respectively, white and 3-meters-long), no other condition than the otherness condition needs to be fulfilled. In conclusion, according the first option, the otherness condition would be necessary and sufficient for coincidental change to occur, whereas it would be only necessary with relation to natural change.

An unwelcome consequence seems to challenge the first option, for it seems to entail that coincidental change is prior to, or at least independent from, natural change. In other words, coincidental change would not require the necessary and sufficient conditions for natural change to be fulfilled, in order to occur. Conversely, it would be mandatory for natural change that the necessary and sufficient condition of coincidental change (the otherness condition) is fulfilled. Thus, with relation to their conditions of possibility, coincidental change would not entail natural change, but natural change would entail coincidental change.

This consequence of the first interpretation is unwelcome, for Aristotle clearly understands the priority relation between coincidental and natural change in the opposite way.

> Relational scheme of the kinds of change: natural change independent of coincidental change, whereas coincidental change is dependent on natural change.

According to the second option, the otherness condition would be instrumental to the distinction between coincidental and natural change, for it would apply to the latter, but not to the former. *Phys.I.8* (191b17ff.) contemplates the cases of coincidental change in which animal comes into being out of animal, and dog out of dog. Although here the examples regard the relation between what comes into being and its moving cause, it may provide, *mutatis mutandis*, evidence for coincidental change of the kind “C comes to be out of C”.

If this were the case, nonetheless, coincidental change may occur independently of natural change, for it would occur independently of the otherness condition, and no natural change occurs in absence of it. This, again, contradicts the Relational scheme of the kinds of change.

The negative results of the first and second option exclude the possibility that the otherness condition may positively contribute to draw a distinction between coincidental change and natural change. Moreover, with relation to coincidental change, it has appeared unclear whether the otherness condition must be fulfilled or not. On the one hand, if coincidental change rests on natural change, and natural change on the otherness condition, coincidental change must rest on the otherness condition as well. On the other hand, coincidental change of the type "C comes to be out of C" obviously violates the otherness condition.

I believe that the otherness condition is the general, necessary source condition (SC^{c}) for *every* kind of change, for it is the necessary condition of natural change, and natural change is in turn the necessary condition of possibility for coincidental change.

In order for A and B to qualify as sources of *natural* change, an additional, necessary and sufficient condition (SC^{nc}) must be fulfilled.

In order for A and C to qualify as sources of coincidental change, the conditions for natural change (including the otherness condition) must be fulfilled. Namely, there has to be two sources A and B qualifying as sources of natural change. Moreover, a further necessary and sufficient condition for coincidental change (SC^{cc}) must be fulfilled. Namely, that C is numerically one with (at least) B. With relation to SC^{cc}, the otherness condition is not mandatory, for the case may be given that both A and B are numerically one with C, so that C comes to be out of C.

This interpretation squares with the relational scheme of the kinds of change, for it makes coincidental change dependent on natural change. Moreover, it explains away the case of coincidental change between C and C in *Phys.I.8*.

What the passage of *Phys.I.8* shows is that there may be coincidental change between C and C (and thus in absence of the otherness condition). Nonetheless, this coincidental change occurs only on condition that A and B qualify as sources of natural change (for A and B fulfil all SC^{nc}'s, including the otherness condition), and that C comes to coincide numerically with both A and B. Thus, in the case of coincidental change between C and C, the real sources of change (i.e. the

sources of natural change, A and B) fulfil the otherness condition. Nonetheless, both A and B can be described according to a coincidental property C that remains unchanged in both A and B, so that A=C and B=C. In this scenario, the natural change between A and B happens to be coincidentally the change between C and C. This notwithstanding, it remains true that, in order for coincidental change to occur, the otherness condition must hold, for it must hold of the sources of natural change grounding coincidental change.

In conclusion, the otherness condition is the necessary source condition of change in general, for it is the necessary condition of natural change, and coincidental change depends on natural change. Nonetheless, it is not necessary with relation to SC^{cc}. Namely, it is necessary with relation to what really changes (i.e. A and B), when C comes to be out of C; but it is not necessary with relation to what comes to coincide with A and B.

In §2.1.1, I expand on SC^{nc}, namely on the necessary and sufficient condition for natural change. I claim that, in order for natural change between A and B to occur:

> (1) the necessary otherness condition must be fulfilled with relation to the sources of natural change (i.e. A≠B).
>
> (2) SC^{nc} must be fulfilled with relation to the sources of natural change, i.e. A and B have to be in a relation of reciprocal contrariety.

In §2.1.2, I expand on SC^{cc}, namely on the necessary and sufficient for coincidental change. I claim that, in order for coincidental change between A and C to occur:

> (1) there must be two sources of natural change A and B which fulfil both conditions for natural change, namely:
>
> > (1.a.) the otherness condition must be fulfilled with relation to the sources of natural change (i.e. A≠B);
> >
> > (1.b.) SC^{nc} must be fulfilled with relation to the sources of natural change, i.e. A and B must be in a relation of reciprocal contrariety.
>
> (2) (SC^{cc}) there has to be at least a C that is coincidentally one with at least one of the sources of natural change.

With relation to coincidental change, the conditions for natural change in (1) are necessary, whereas the condition SC^{cc} in (2) is both necessary and sufficient.

2.1.1.2. Second (necessary and sufficient) source condition for natural change (SC^{nc}).

In the previous section, I claimed that the otherness condition is a necessary, non-sufficient source condition, for it prescribes a merely negative constraint. Here, I deal with the positive, sufficient source condition for natural change.

In order to qualify as the sources of natural change, A and B must enjoy a relation of reciprocal contrariety ($A/B=H^+/H^-$), or qualify as intermediates between two contraries ($i^{H+/H-}$).

> SC^{nc} = A and B qualify as sources of natural change, either iff $A=(H^+$ or $i^{H+/H-})$ and $B=(H^-$ or $i^{H+/H-})$; or iff $A=(H^-$ or $i^{H+/H-})$, $B=(H^+$ or $i^{H+/H-})$.

Let us consider two couples of values of A and B that fulfil the otherness condition, but that, respectively, do and do not qualify as sources of natural change. (1) The case in which A and B coincide with the contraries H^+ and H^-, e.g. white and black, or with any of their intermediates ($i^{H+/H-}$), e.g. magenta, cobalt blue, royal yellow. (2) The case in which A and B coincide with any two chance things that do not enjoy intrinsically[50] any other reciprocal relation than reciprocal otherness ($A \neq B$), e.g. white and smooth.

In case (2), the fact that white and smooth fulfil the otherness condition, makes it possible for them to qualify as sources of natural change. Nonetheless, white and smooth do not stand in any necessary, stable, reciprocal relation, excluding reciprocal otherness. As I have claimed,

[50] With the word "intrinsically" (which could be replaced by "per se"), I mean to add an important requirement: the sources of coincidental change may indeed, under certain conditions, appear to enjoy a particular relation of contrariety, and thus fail to qualify as any two chance things A and B enjoying no other reciprocal relation than reciprocal otherness. For instance, in the case of John suffering from tactile-visual synaesthesia, the visual perception of white may be invariably coupled with the tactile perception of roughness, and the visual perception of black may be invariably coupled with the tactile perception of smoothness. According to this scenario, John may confidently claim that white changes *naturally* into smooth. The explanation of John's mistake is that white and smooth enjoy a relation of contrariety only privately (or coincidentally), but not intrinsically (or per se). When John experiences white invariably changing into smooth, what happens is that white changes *naturally* into black, but black and smooth are for John (privately and *coincidentally*) one thing. The relation which white and smooth invariably enjoy for John fails to qualify as intrinsic to white and smooth (or to inhere per se in white and smooth). Therefore, white and smooth fail to qualify as sources or sources of natural change, for they are intrinsically any two chance things with relation to each other, although they may appear to enjoy a particular relation of contrariety under private or accidental circumstances.

otherness is a merely negative relation; therefore, it cannot yield the regularity expected from natural change. Such regularity must rest on a special reciprocal relation necessarily binding the sources of change A and B. Moreover, change seems to require similarity along with otherness, and no similarity between A and B can be grounded on their reciprocal otherness.

To be sure, I have claimed in the previous section that white and smooth happen to qualify as the sources of a specific kind of change, namely of coincidental change. Nonetheless, this is not grounded on their reciprocal otherness, but rather on a special source condition of coincidental change (SC^{cc}).

In case (1), the values of A and B = H^+ and H^- (e.g. white and black) qualify as sources of natural change, for they fulfil both the necessary otherness condition and the necessary and sufficient SC^{nc} for natural change.

The otherness condition is fulfilled by H^+/H^-, for, within a contrary pair, one member of contrariety belongs to one side of the opposition of contradiction, whereas the other member of contrariety belongs to the other side of contradiction. In fact, contrariety is a species of the genus of contradiction, and the member of each contrary couple are reciprocally incompossible. Thus, when the necessary and sufficient source condition for natural change is fulfilled, by necessity the otherness condition is also fulfilled, for every H^+/H^- is $H^+/\neg H^+$. The converse does not hold, for it is not true that every $H^+/\neg H^+$ is H^+/H^-.

With relation to the necessary and sufficient source condition for natural change (SC^{nc}), I argue here that H^+/H^- *may* qualify as such, for they stand in a determinate, necessary relation. In the next two sections, I argue *that* and *why* they qualify as such.

Unlike the negative term of the contradictory couple $H^+/\neg H^+$, the negative contrary H^- is one particular, determinate item within the genus $\neg H^+$. Unlike the contradictories $H^+/\neg H^+$, the contraries H^+/H^- are necessarily bound to each other by an intrinsic relation of a certain kind. Thus, they *may* qualify as sources of natural change, for they are a positively and necessarily determinate couple of items.

The same holds for each and every value of $H^+/\neg H^+$ identifying with any of the intermediates ($i^{H+/H-}$) between the contraries H^+/H^-. In the case of white and black, for example: magenta,

cobalt blue, royal yellow. For the intermediates are necessarily determined by their extremes, the contraries, and therefore stand in a necessary relation with each other and with their extremes.

2.1.1.3. SC^{nc} and its justification.

The justification of SC^{nc} has been and is heavily disputed. The issue is made more severe by the fact that it is intertwined with a second problem. Arg.2 of *Phys.I.5* argues that contraries are principles of natural things. The definitive answer to the question on the identity of the principles of natural things that we receive in *Phys.I.7*, and which *Phys.I.5* contributes to reach, is that the couple of opposites form and privation are principles. Thus, if we want Arg.2 of *Phys.I.5* to be instrumental to reaching the result of *Phys.I.7*, two strategies are viable.

The first strategy is to hold that ἐναντίον means in *Phys.I.5* "opposite" in general (and not "contrary" in particular). On the one hand, the first strategy has the advantage to include privation in the claim of Arg.2 of *Phys.I.5* (for both privations and contraries are opposites). On the other hand, this interpretation fails to individuate one particular kind of opposition within the contradictory opposites A/¬A, which, due to a particular kind of opposites, qualifies as a source of natural change.

The second strategy is to hold that ἐναντίον in Arg.2 of *Phys.I.5* means the particular kind of opposition of contrariety. The advantage of this strategy is that it succeeds in selecting a particular kind of opposition within the contradictories (i.e. contrariety) as the source of natural change. The disadvantage of this reading is that it raises issues with relation to the possibility to use the result of Arg.2 of *Phys.I.5* for the results of *Phys.I.7*.

In the next section (§2.1.1.3.1.), I present the two main interpretative proposals for the justification issue that are on the table. In §2.1.1.3.2, I analyse these two interpretations with particular attention to their impact on the development of the argument in *Phys.I.5-7*. The outcome of my discussion is a defence of the proposal advanced by Bogen in 1997. Bogen, nevertheless, did not tackle the issue concerning the applicability of his proposal to the development of the argument in *Phys.I.5-7*, which has been raised with more or less emphasis by other scholars (in particular, in Bostock 1982). The solutions to this problem have been quite unsatisfactory.

I claim that, in the overall agenda of *Phys.I.5-7*, the following section of the text of *Phys.I.5* (188b8-23) has the function to tackle the applicability issue of Arg.2 of *Phys.I.5*. Aristotle wants to show that there is a homogeneity between the cases explained by the opposition of form/privation and ones explained by the opposition of contrariety. He does so in pre-technical language, by means of terms such as "being-formed/being-unformed" and, subsequently, "excess/defect". This is something we expect from a context such as that of *Phys.I.5*, in which Aristotle provides arguments that he is ready to endorse, but that are partially dependent on the language and conceptual tools of his predecessors.[51] Although the attept to build a bridge between non-substantial change and substantial change in 188b8-23 is pre-technical and unsatisfactory, it nonetheless provides evidence for the first strategy.

2.1.1.3.1. SC^{nc} and its justification. An overview of the secondary literature.

Scholarship can be divided into two main currents with relation to the attempt to find a justification for SC^{nc}. The first current was initiated, to my knowledge, by James Bogen[52] and followed by most interpreters[53] before and after Kelsey. The second attempt of finding a justification for SC^{nc} is represented by Sean Kelsey,[54] who has reacted to Bogen and his partisans.

According to Bogen's interpretation, contraries and intermediates qualify as sources of natural change, for each couple of contraries identify a certain logical range.

> SC^{nc} = range determinacy condition = A and B qualify as sources of natural change, iff A and B belong to the same range.

Let us consider a couple of contraries H^+/H^- (e.g. white and black), the set of their intermediates ($i^{H+/H-}$, e.g. magenta, cobalt blue, royal yellow) and any chance item G (e.g. smooth) that is related to H^+ merely by virtue of being $\neg H^+$.

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[51] *Phys.*, I.5, 188b26-189a10 shows Aristotle's general attitude towards his predecessors with relation to the topic of the principles of change. In a nutshell, Aristotle thinks that the theories of his predecessors are (at least mostly) on the right track, but that they (a) lack the required degree of conceptual abstraction; (b) must be supported with arguments (which Aristotle does with Arg.2). Thus, Aristotle is willing, at least to some extent, to endorse the conceptual tools of his predecessors and argue by means of them.
[52] Bogen1997.
[53] Recently, Delcominette (unpublished paper) and Judson (unpublished paper).
[54] Kelsey 2007.

The contraries H^+/H^- and their intermediates $i^{H+/H-}$ constitute a determinate range; the contradictories H^+/G do not. For example, white and black qualify as the extremes of the continuous range of colour, for, assuming that the degree of a colour depends on its capacity of widening sight, white possesses the capacity of widening sight to the biggest extent, whereas black lacks this capacity to the greatest extent (or possesses the opposite capacity, i.e. the capacity to narrow sight, to the greatest extent). The intermediate colours are disposed at determinate points between the extremes of black and white according to the degree of the capacity of widening sight they possess. For example, royal yellow possesses the capacity of widening sight to a smaller degree than white; magenta is less capable of widening sight than yellow, but more capable than cobalt blue; cobalt blue is more capable of widening sight than black, but less capable than magenta. Thus, each of the intermediate colours occupies a definite place within the continuous range of colour stretching from what possesses the maximum degree of the capacity to widen sight (white) to what possesses the minimum degree thereof (black).

Unlike the contraries H^+/H^-, the contradictories H^+/G (where $G=\neg H^+$) do not yield a determinate range and cannot therefore qualify as sources of natural change. This fact can be ascertained by virtue of a negative consideration. It is reasonable to assume that, if two items A and B qualify as the extremes of a certain range, A and B must enjoy a necessary, intrinsic relation safeguarding the necessary, immutable topology of the range. In other words, it is reasonable to believe that the extremes individuating a certain range (A and B) and their definite set of intermediates $i^{A/B}$ enjoy an intrinsic reciprocal relation of some kind. Since G is any chance value of $\neg H^+$, H^+ and G cannot qualify as a couple of items necessarily associated by any intrinsic relation. Therefore, H^+ and G cannot intrinsically belong to the same range (and a fortiori cannot intrinsically qualify as the extremes of a certain range).

The range determinacy reading inaugurated by Bogen has indeed the advantages of being grounded on several Aristotelian texts, first and foremost on *Metaph.X.3-4*.[55] In *Metaph.X.3-4*, Aristotle claims that contradictories are too radically unrelated in order to affect each other and

[55] *Metaph.*, X.3, 1054b28-30: "Things which have no common matter and do not come to be from each other are said to differ with respect to the genus, i.e. things which belong to different categories." Even more clearly: *Metaph.*, X.4, 1055a6-10: "Things which differ with respect to the genus do not allow for any reciprocal passage, but are rather at great extent far from each other and incomparable. Things which differ with respect to the range are things that generate from the contraries as extremes, and the distance between the extremes is the greatest, as the distance between contraries is."

yield change. Contraries, instead, fulfil two requirements for change that Bogen must evidently understand as both necessary and sufficient.

(1) H^+/H^- are not mere others; rather, they are *different* items. They have something in common, for they belong to the same genus, of which they represent the maximal difference. Being reciprocally similar and not just other than each other, they have capacity to affect each other and yield change. Contradictories, instead, are mere others, and thus too radically distant from each other for possessing the capable for to affect each other and yield change.

> SC^{nc} = range determinacy condition = difference condition = A and B qualify as sources of natural change, iff A and B are reciprocally different.

(2) H^+ (or $i^{H+/H}$) is, within the same range, other than H^- (or $i^{H+/H-}$) and fulfils thus the otherness condition for change. For, H^+/ H^- always coincide with $H^+/\neg H^+$.

The range determinacy reading has the disadvantage of applying only to the particular opposition of contrariety and not to the opposition of form and privation, that is elected as principle of natural things in *Phys.I.7*. If the difference condition holds, then we need an additional conceptual step to extend the range determinacy condition to the opposition of form and privation. I refer to this problem as to the applicability issue.

Sean Kelsey's proposal for the justification of SC^{nc} solves the applicability issue, for it applies to opposition in general. Nonetheless, it does not seem to square with the endeavour of Arg.2 to select a particular subset of opposites fulfilling SC^{nc}.[56]

According to Kelsey, natural change would occur between opposites (in general), for opposites possess opposing capacities enabling them to take each other out of their own nature. For instance, white possesses the capacity to widen sight, whereas black possesses the capacity to narrow sight. White can interact with black and yield change, for white possesses the capacity to annihilate black, namely to annihilate its capacity to narrow sight.

[56] For the sake of accuracy, the rationale of Kelsey's interpretation has nothing to do with the worry related to the applicability problem. Rather, Kelsey's reading is motivated by the aporia raised at the end of *Phys.I.6*. According to Kelsey, the aporia arises from a strong incompatibility between the arguments of *Phys.I.5* and *Phys.I.6*. In this connection, Arg.2 from *Phys.I.5* would endorse a destructive interpretation of change, whereas the arguments of *Phys.I.6* would endorse a conservative, non-destructive interpretation of change.

SC^{nc} = opposing capacities condition = A and B qualify as sources of natural change, iff A and B possess opposing capacities, such that A has the capacity to bring B out of its nature and B has the capacity to bring A out of its nature.

In the next section, I discuss the advantages and disadvantages of Bogen's and Kelsey's proposals. I defend Bogen's proposal and show how the applicability issue is explicitly addressed by Aristotle.

2.1.1.3.2. SC^{nc} and its justification. An assessment.

As I have already mentioned, Bogen's justification of SC^{nc} is faced with what I called the applicability issue. It is clear that the range determinacy condition suits some of the examples of *Phys.I.5*, especially the case of colour that Bogen uses as a paradigmatic model for change in general. It is nevertheless also clear that the range determinacy condition is faced with difficulties, when different models of change are at stake.

The main difficulty for the range determinacy reading is represented by the case of substantial change, which is made in *Phys.I.7* into the subject of enquiry. In answering the question concerning the identity of the principles of substantial change, in *Phys.I.7*, Aristotle selects a different kind of opposition than contrariety, namely form and privation. Now, the privation of a certain form, for example the privation of man, appears to be hardly anything determinate as black is. If this is the case, the substantial range of man presents a different topology that the range of colour and fails to qualify as a determinate continuum stretching between two determinate extremes. Rather, the substantial range of man seems to be delimited by an extreme that is determinate (the form of man) and by one extreme that is indeterminate (the privation of man). Moreover, it is unclear whether the stretch man-privation of man may qualify as a continuum, as the range of colour does. In fact, there seems to be no intermediate between man and non-man: it seems that something either is or is not man. In conclusion, the topology of substantial ranges and the topology of non-substantial ranges (or at least of qualitative ranges) appears to be different, both with relation to the criterion of determinacy of the range and to its continuity or discreteness.

Similar problems seem to affect quantitative change and locomotion. In both cases, we have indeed one determinate starting point (a determinate quantity and a determinate place at t^1) and a determinate end point of change (a determinate quantity and a determinate place at t^2). Nonetheless, it is not clear how the starting point and the end point of quantitative change and locomotion may qualify as the extremes of a range. In fact, a quantitative range seems to stretch from zero (the complete lack of quantity) to infinite. Similarly, if we place two spatial starting/end points of locomotion onto an ideal line, it seems possible to pick out infinitely many more extreme starting/end points along the ideal line.[57]

This difficulty notwithstanding, Aristotle endorses the view that change occurs between contrary pairs not only in *Phys.I* (where quantitative and local change are not mentioned), but also in *Phys.V.1*, where qualitative, quantitative and local change are explicitly mentioned, and are explicitly said to occur between contrary pairs.

I do not deal with the difficulty related to quantitative and local change in detail for two reasons. Firstly, because it is not mentioned in *Phys.I*. Secondly, because I have nothing to add to the solution of the problem that has been already advocated by some interpreters. It has in fact been suggested that, in a finite universe as Aristotle's, it makes sense to speak of extreme spatial points. A rectilinear locomotion from point A to point B may be considered as the locomotion between two extremes placed at the border of the universe (or their intermediates). With relation to quantity, it has been reminded by several interpreters that natural beings possess capacity for quantitative change with relation to a determinate minimum and maximum. For instance, a human being cannot grow shorter than a minimum and taller than a maximum that both ensure the correct functionality of the human body. Thus, when I grow 1 inch taller, this growth is contained within a range stretching from the minimum and the maximum height for which my body has capacity.

Unsatisfactory as these solutions may be for a modern reader, they are probably satisfactory ways of making sense of Aristotle's endorsement of the range determinacy condition within his own conceptual framework.

[57] Non-rectilinear kinds of locomotion raise specific problems that I am not going to tackle.

The justification of SC^{nc} proposed by Kelsey has the advantage of not being exposed to the applicability problem affecting the previous reading. In fact, a couple of contraries H^+/H^- qualifies as a source of change, iff H^+ and H^- possess opposing capacities and are thus capable of taking each other out of their own nature. Likewise, a couple of privative opposites F^+/F^- qualifies as a source of change, iff F^+ and F^- possess opposing capacities and are thus capable of taking each other out of their own nature.

This advantage notwithstanding, Kelsey's capacity condition is exposed to the suspicion of being extraneous to the conceptual tools employed in *Phys.I*. On a close inspection of *Phys.I* as a whole, Aristotle does not employ the δύναμις/ἐνέργεια vocabulary before the very last chapter of the book, and even there, it is done in a pre-technical and mainly dialectical way.

In addition to the general absence of the δύναμις/ἐνέργεια vocabulary in *Phys.I*, one passage from *Phys.I.8* clearly excludes this perspective from the solution of one of the central problems of *Phys.I*. In *Phys.I.8*, Aristotle tackles the Eleatic aporia rejecting the possibility of change both from being and from non-being (or from being-X and non-being-X). After having solved the Eleatic aporia with the conceptual tools of *Phys.I.7*, Aristotle makes the following statement:

> *Phys.*, I.8, 191b27-9
>
> εἷς μὲν δὴ τρόπος οὗτος, ἄλλος δ' ὅτι ἐνδέχεται ταὐτὰ λέγειν κατὰ τὴν δύναμιν καὶ τὴν ἐνέργειαν· τοῦτο δ' ἐν ἄλλοις διώρισται δι' ἀκριβείας μᾶλλον.
>
> And this[58] is one way [to treat these things]. A different way consists in claiming that it is possible to treat these things with relation to capacity and actuality. This way will be fleshed out in other [writings] with greater precision.

In this passage, Aristotle claims that the Eleatic aporia can be solved also with the help of different conceptual tools than the one developed in *Phys.I.7*, namely with the help of the concepts of potentiality and actuality. He adds that he is not going to pursue this kind of solution in *Phys.I*, but that he is rather going to expand on it in a different book. This can be reasonably read as a statement that the perspective of natural capacities is extraneous to the scopes and to the conceptual machinery of *Phys.I*.

[58] "This" refers to the solution of the Eleatic aporia spelled out in the preceding lines. It is to the Eleatic aporia that the following ταὐτὰ λέγειν refers to.

In conclusion, Kelsey's capacity condition, on the one hand, is not confronted with the applicability issue of Bogen's range determinacy condition. On the other hand, the capacity condition is exposed to the suspicion of being extraneous to the conceptual horizon of in *Phys.I*.

My proposal for the solution of the difficulty concerning the justification of SC^{nc} can be seen as a defence of Bogen's interpretative line. The range determinacy interpretation advocated by Bogen is, I believe, theoretically too appealing and too well-grounded on parallel texts to be dismissed.

I believe that Aristotle endorses the range determinacy condition as a justification for SC^{nc}, and that the agenda of Arg.2 revolves around the defence of this endorsement. In my reading, Aristotle first (188a30-b8) endorses SC^{nc} on the ground of the range determinacy condition with relation to examples for which the range determinacy condition is evidently well-suited (e.g. colour). Aristotle then (188b8-23) proceeds defending the validity of the range determinacy condition in the limit case of composite contraries. The extremes of change considered in the examples of composite contraries, I claim, are features belonging to the category of substance, such as being-composite/being-non-composite and being-formed/being-formless. Perhaps with a certain degree of overconfidence, in 188b8-23 Aristotle intends to show that formal features engaged in substantial change are not dissimilar from the non-substantial contraries and also fulfil the range determinacy condition.

In §2.2, I discuss the extent of the homogeneity between standard contraries and limit cases such as composite contraries, i.e. substantial opposites considered in a pre-technical way. I reject a strong version of this homogeneity claim entailing that the substantial opposites are both determinate items such as white and black. I rather opt for a weak reading of the homogeneity claim, which rejects the previous assumption, but states that the range determinacy condition is secured by the positive opposite alone (i.e. by the form).

2.1.2. The source condition of coincidental change.

I have claimed that – against what a *prima facie* reading of *Phys.*, I.5, 188a30-b8 may suggest – Aristotle does not believe that two items A and C qualify as sources of coincidental change, iff the otherness condition is fulfilled (i.e. iff $A \neq C$). If this were the case, coincidental change would

be prior to and independent of natural change, for natural change must fulfil the otherness condition and an additional, necessary and sufficient SC^{nc}.

Instead, it is evident that Aristotle believes natural change to be primary with relation to coincidental change. Therefore, in order for one item C to qualify as sources of coincidental change, the conditions for natural change must first be fulfilled. In other words, in order for C to qualify as a source of coincidental change, there must be two items A and B which qualify as sources of natural change, for they fulfil the necessary otherness condition ($A \neq B$) and the necessary and (with relation to natural change) sufficient SC^{nc} ($A=H^+$ and $B=H^-$; or $A=H^-$ and $B=H^+$).

Both source conditions for natural change are, with relation coincidental change, only necessary, for coincidental change does not occur in absence of them. They are nonetheless non-sufficient, for their fulfilment does not entail the identification of the sources of coincidental change, or coincidental change would identify with natural change.

In order for one item C (or two items C and D) to qualify as a source of coincidental change, two conditions must be fulfilled.

First, C must fulfil the otherness condition: $C \neq A$ and B (or C and $D \neq A$ and B). If this were not the case, the distinction between coincidental change and natural change would collapse. This condition is necessary, but not sufficient.

Secondly, an additional, necessary and sufficient condition for coincidental change (SC^{cc}) must be fulfilled:

> SC^{cc} = C qualifies as a source of coincidental change, iff C is numerically one with either A or B.[59]

[59] Aristotle's examples of coincidental change contemplate the case in which one source of coincidental change is one of the sources of natural change (either A or B), whereas the other source of coincidental change is a third item C that is numerically one with either A or B. A second case is comtemplated in *Phys.I.8*, where C is both the starting point and the end point of coincidental change, for C is numerically one with both A and B. A third case of coincidental change is thinkable, according to which the sources of coincidental change are two items C and D that are different from A and B, and each is numerically one with either A or B (i.e. C is numerically one with A, and D is numerically one with B; or vice versa). In conclusion, coincidental change occurs, iff there is *at least one* source C that fulfils SC^{cc} (i.e. that is numerically one with either A or B).

I will not expand here on the technical notion of "being numerically one", or of numerical coincidence. The notion returns prominently in *Phys.I.7*, where it is instrumental to the solution of the aporia raised in *Phys.I.6*. In *Phys.I.7*, the notion is numerical coincidence is contrasted with that of formal coincidence (i.e. of being one in form), or of coincidence/being one in being. As an overview, these two notions are complementary and clarify each other. Let us exemplify them with relation to two items X and Y.

If X and Y differ with relation to their essence and definition (or to their being), then X and Y are not one in form. For instance, the dramatic tenor Max Lorenz and the role of Siegmund in Richard Wagner's "Die Walküre" are two different beings with relation to their essence or definition. What it is for Max Lorenz to be is different from what it is for Wagner's Siegmund to be. The former is[60] a substance existing in reality, whereas the latter is a fictional character.

Listening to the famous recording of Richard Wagner's "Die Walküre" conducted by F. Stiedry at the *Met* in 1949, I may utter the sentence: "In this recording, Max Lorenz is Siegmund". Being an enthusiastic admirer of Max Lorenz, I may even push my statement further and claim emphatically: "Max Lorenz *is* Siegmund" (meaning that Max Lorenz is Siegmund *par excellence*). In this case, two items differing in essence, Max Lorenz and Siegmund, are numerically one, for they are counted as one single item. In fact, there is one single item, namely Max Lorenz, that is both Max Lorenz and Siegmund.

Finally, as I marvel at Max Lorenz's high C, I may wonder what a tenor high C is and answer this question with the definition: "A tenor high C is a note that is 523 Hz. high". In this case, two items – "tenor high C" and "note that is 523 Hz. high" – are one in form or in being, for their essence and their definition are the same.

Let us go back to the case of Max Lorenz and Siegmund coinciding numerically. In this case, something that is one in number, Max Lorenz, is two in form. Considered in himself, Max Lorenz is an individual man who happens to be an incredibly gifted dramatic tenor. With relation to the role he inhabited at the *Met* on the 29th of January in 1949 under the baton of F. Stiedry,

[60] Or rather *was* such, as Max Lorenz existed in reality as a living being in a temporal stretch comprised between his birth and his death. For the sake of example, I do not consider here the temporal constraints to Max Lorenz's existence in reality, but consider him as a presently living being.

Max Lorenz happens to coincide numerically with a fictional character created by Richard Wagner in his opera "Die Walküre".

When X and Y are one in number, X and Y do not enjoy any intrinsic relation. Max Lorenz and Siegmund, for instance, merely *happen* to coincide numerically. In fact, Max Lorenz coincides with Siegmund only whenever he inhabits the role of Siegmund (or regularly for anyone who holds the private opinion that Max Lorenz *is* Siegmund *par excellence*). The absence of any intrinsic, necessary relation between two items X and Y that are one in number is shown by the fact that X and Y are not permanently in relation with each other, but rather merely come together on certain occasions. Max Lorenz is by virtue of an intrinsic, necessary relation man and rational. Max Lorenz is Siegmund only on the occasions in which he performs Siegmund, or, regularly, only to the private judgement of a fervent admirer.

In the same connection, SC^{cc} prescribes that C qualifies as a source of coincidental change, if and only if C happens to be one in number with one of the sources of natural change (either A or B). C and A (or B) are two items that are different in form, but happen to coincide numerically as a single item.

When a certain item changes coincidentally from A to C, this does not happen according to any necessary connection between A or B and C, but rather by virtue of: (SC^{nc}) the necessary, intrinsic relation between A and B; and (SC^{cc}) the casual numerical coincidence of C with either A or B. In fact, the relation between the source of coincidental change C and the two sources of natural change A and B is neither an intrinsic nor a necessary one.[61]

For instance, an item changes from white to smooth, if the source conditions for a natural change from white are fulfilled (i.e. if there are two sources of natural change: white and black, or their intermediates); and iff (SC^{cc}) smooth happens to be one in number with black. The relation between black and smooth, or any other source of coincidental change, is non-intrinsic and non-necessary. Smooth, 3 feet-high, well-pitched can all be one in number with black and sources of natural change with relation to white, provided that black coincidentally happens to be also smooth, 3 feet-high and well-pitched.

[61] In the case in which coincidental change occurs between two sources C and D that are both other than A and B, the relation between C and D is neither intrinsic nor necessary. Of the same kind is the relation enjoyed by C and D with A and B.

As an overview, coincidental change occurs:

if there are two items A and B such that

A≠B (otherness condition with relation to the sources of natural change; necessary with relation to coincidental change); and

(SC^{nc}) = $A=H^+$ and $B=H^-$; or $A=H^-$ and $B=H^+$ (Necessary and sufficient with relation to natural change. Only necessary with relation to coincidental change);

if there is (at least) a C such that

C≠A and C≠B (otherness condition with relation to the sources of coincidental change; necessary with relation to coincidental change); and

iff

(SC^{cc}) C is numerically one with either/both A or/and B (necessary and sufficient with relation to coincidental change).

2.2. Contraries as principles of change of natural things. Dispelling a threat to the source condition for natural change (SC^{nc}).

Phys., I.5, 188b8-23

ὁμοίως δὲ τοῦτο καὶ ἐπὶ τῶν ἄλλων, ἐπεὶ καὶ τὰ μὴ ἁπλᾶ τῶν ὄντων ἀλλὰ σύνθετα κατὰ τὸν αὐτὸν ἔχει λόγον· ἀλλὰ διὰ τὸ μὴ τὰς ἀντικειμένας διαθέσεις ὠνομάσθαι λανθάνει τοῦτο συμβαῖνον. ἀνάγκη γὰρ πᾶν τὸ ἠρμοσμένον ἐξ ἀναρμόστου γίγνεσθαι καὶ τὸ ἀνάρμοστον ἐξ ἠρμοσμένου, καὶ φθείρεσθαι τὸ ἠρμοσμένον εἰς ἀναρμοστίαν, καὶ ταύτην οὐ τὴν τυχοῦσαν ἀλλὰ τὴν ἀντικειμένην. διαφέρει δ' οὐθὲν ἐπὶ ἁρμονίας εἰπεῖν ἢ τάξεως ἢ συνθέσεως· φανερὸν γὰρ ὅτι ὁ αὐτὸς λόγος. ἀλλὰ μὴν καὶ οἰκία καὶ ἀνδριὰς καὶ ὁτιοῦν ἄλλο γίγνεται ὁμοίως· ἥ τε γὰρ οἰκία γίγνεται ἐκ τοῦ μὴ συγκεῖσθαι ἀλλὰ διῃρῆσθαι ταδὶ ὠδί, καὶ ὁ ἀνδριὰς καὶ τῶν ἐσχηματισμένων τι ἐξ ἀσχημοσύνης· καὶ ἕκαστον τούτων τὰ μὲν τάξις, τὰ δὲ σύνθεσίς τίς ἐστιν. εἰ τοίνυν τοῦτ' ἔστιν ἀληθές, ἅπαν ἂν γίγνοιτο τὸ γιγνόμενον καὶ φθείροιτο τὸ φθειρόμενον ἢ ἐξ ἐναντίων ἢ εἰς ἐναντία καὶ τὰ τούτων μεταξύ.

And similarly, this [claim] can be extended to all cases. For it is reasonable that also the beings that are not simple, but rather composite, [are treated] according to the same claim. Nonetheless, one overlooks that it is the case because these opposite dispositions are not called by names. For it is necessary that, in every case, the joined comes to be out of non-joined and the non-joined comes to be out of joined; and the joined ceases to be

> into non- joinedness; and not any chance non-joinedness, but rather the non-joinedness that is the opposite [to the joinedness]. And it makes no difference if we consider joinedness or disposition or composition, for it is evident that the same claim [applies to all of these]. Indeed, the house and the statue and all other things of this kind come to be in the same way. For the house comes to be out of the not-being-composed and [out of the] being-divided that is such and in this wise; the statue and what is formed [come to be] out of the formlessness. And of these, one is disposition and the other is a certain composition.
>
> In conclusion, if this is true, what comes to be comes to be and what ceases to be ceases to be out of a contrary into [its corresponding] contrary, or any of the intermediates between them.

In *Phys.*, I.5, 188b8-23, Aristotle tackles a set of objects, the so-called composite contraries, which apparently pose a threat to the source condition for natural change (SC^{nc}: A and B qualify as sources of natural change, iff A and B are contraries or intermediates). The conclusion reached at the end of the passage (lines 21-3) restates SC^{nc}. Evidently, Aristotle is confident of having dispelled the threat to SC^{nc} posed by composite contraries.

The issue whether composite contraries fulfil SC^{nc} is not a trivial one and Aristotle's solution is introduced with some (at least rhetorical) caution: εἰ τοίνυν τοῦτ' ἔστιν ἀληθές. The reason why the issue is not trivial lies in the nature of its objects. So, what are the composite items at stake?

At face value, the objects raising a difficulty are qualified as composite ones, in contrast with simple beings such as white or black from the previous lines. A key distinction drawn in *Phys.I.7* is the one between simple and composite items. There, nonetheless, what is simple is either one of the contraries or the substrate, whereas what is composite is the unity of the substrate and a contrary. Here, the distinction must have a different meaning, for the substrate has not been introduced, yet. Let us consider the instances of composite items mentioned in our passage. The statue is something-formed (ἐσχηματισμένον) coming to be out of the formlessness; these latter belong to the genus of the disposition. The house comes to be out of the non-being composed, i.e. out of the being-divided. The term ἁρμονία and its derivatives are difficult to translate. It is most plausible that the terms refer to the being-joined or to the being-arranged of the parts of something. At face value, the composite contraries addressed in our passage are those that entail a certain composition of their parts. For instance, the sources of change for the statue are the disposition, and the lack thereof, of the parts of the statue (the legs, the torso, the arms, the head).

When these parts are in a certain reciprocal disposition, the statue is something-formed. When they are not, the statue is formless.

The fact that the examples provided in the passage belong to the realm of substances suggests an interpretation of the difficulty that will result more insightful for the development of the argument in *Phys.I.5-7*. Although the difference between substances and non-substances is laid bare only in *Phys.I.7*, the concept of substance plays an important role already in the arguments of *Phys.I.6*.[62] I believe that the issue raised in *Phys.*, I.5, 188b8-23 concerns substantial forms and their privations.

A counterargument to my claim may be that the examples provided by Aristotle are confined to the realm of artefacts, whose claim to substantiality is controversial. Nonetheless, in *Phys.I*, artifacts are extensively used as models for substantial change in general.[63] Thus, this counterargument can be easily answered.

According to the reading I develop here, the main role of *Phys.*, I.5, 188b8-23 is to solve a difficulty concerning the lack of homogeneity between non-substantial contraries (e.g. white and black) and substantial opposites (e.g. formedness and formlessness).

In *Metaph.VII.7*,[64] Aristotle addresses the imperfect application of the synonymy principle between the artefact and the matter constituting it, as in the cases of the brazen statue. Commonly, we conceptualise the production of the brazen statue as "the statue comes into being out of the bronze". This is nonetheless improper, since the formula "X comes into being out of Y" applies in the cases in which Y does not persist through change, thus failing to fulfil the synonymy principle. Due to this improper attribution of the formula, the bronze is erroneously said to persist not as such (as in "the bronze statue"), but rather imperfectly (i.e. as "of M" or "M-en", e.g. "brazen"). This error of common thought depends on the intrinsic difficulty of identifying negative substantial opposites (i.e. privations) such as formlessness or being-divided. In fact, privations are said to be ἄδηλα.

[62] Cf. §3.3.
[63] Cf. *Phys.*, I.7, 190a31-b9.
[64] *Metaph.*, VII.7, 1033a5ff.

This characterisation of negative substantial opposites leads us to the second difficulty, concerning the intrinsic dishomogeneity between substantial opposites and non-substantial opposites (or contraries).

The being-formed of a certain statue has a name and is something determinate. Its privation has no name and is indeterminate.

The diamond and the coal, similarly, are both generically composite beings, whereas their ways of being-composed differ individually from each other, as diamond and coal are different in form. The matter of both diamond and coal is the same one: atoms of carbon. Most likely, the difference between the form of coal and the form of diamond amounts to the difference between the way in which the atoms are composed in coal and the way in which the atoms are composed in diamond. Before the atoms of carbon are composed into the particular way yielding to diamond or into the other particular way yielding to coal, the scattered bunch of atoms of coal is deprived both of the form of coal and of the form of diamond. In whatsoever particular way the atoms of carbon are scattered in space, none of these particular ways is the determinate opposite of the form of diamond or of coal. Therefore, the privations of the form of diamond and the privation of the form of coal are devoid of the formal determinacy that would enable them to qualify as contraries and to identify a range.

As the absence of a determinate form in a certain matter, privation lacks the positive determinacy which would enable it to identify a range and to oppose to form as a contrary.

The positive and the negative contraries, instead, are two formally determinate items. As I have claimed, the notion of contrariety is linked with the notion of range determinacy, for each term belonging to a contrary pair is one determinate extreme within a given range. White is the colour possessing the capacity to widen sight at maximum degree, whereas black is the colour possessing the maximum degree of the opposite capacity. Roughness is the presence of any discontinuity in a surface, whereas smoothness is the lack thereof. There may be limit cases to this rule, but Aristotle seems to endorse it. For instance, in our framework, contraries such as up and down are bound with indeterminacy, since they are relative to the position of the observer and since, given a point that we consider down with relation to another one, an infinity of lower points are given. In Aristotle's finite universe, instead, up and down are absolute, determinate points.

The difficulty with relation to negative substantial opposites concerns not only the difficulty to identify them, but especially the homogeneity between substantial and non-substantial change. Therefore, the possibility of explaining them with a unified theory. This difficulty concerns the source condition for natural change. As I have claimed,[65] *Phys.*, I.5, 188a30-b8 endorses a necessary, sufficient range determinacy condition for the identification of the sources of natural change within the set of the items fulfilling the otherness condition. Now, privations such as the formlessness relative to a determinate form and the being-divided relative to a certain composition fulfil the otherness condition. From what I have claimed, nonetheless, privations seem to fall short of fulfilling the sufficient condition for natural change. Thus, the formlessness of the bronze does not seem to qualify as the relevant source of the statue more than the formlessness of a gush of air that cannot turn into a statue.

A robust interpretation of a unified theory of the sources of substantial and non-substantial change entails a perfect homogeneity between substantial opposites (forms/privations) and contraries. Namely, it entails a positive formal determinacy of privations. As in the case of non-substantial change, a substance comes into being or ceases to be within a range stretching between a formally determinate privation to its corresponding substantial form. For instance, in a clump of bronze that is the proximate matter of the statue of Ulysses both the form of Ulysses and the corresponding determinate privation thereof would inhere. This latter would be formally different from different determinate privations (say, the privation of the form of Zeus) representing the determinate starting point of other substantial changes culminating in different forms.

Some textual support for the robust interpretation lies in lines 18-9, which seem to mirror 188a30-b8 in pursuing the endeavour to select the relevant sources of natural change out of the contradictories. Taken literally, lines 18-9 claim that what is joined comes not out of any chance non-joined whatsoever, but rather out of *a certain determinate* non-joined that is opposed to the determinate being-joined that is proper to the house. The determinacy of the particular non-joinedness that qualifies as the source of the house seems to be expressed in the text by the words

[65] Cf. §2.1.

ταδὶ ὠδί in line 19. The robust reading has been endorsed by Judson[66] with relation to *Metaph.XII.2*, and, with relation to *Phys.I.5*, by Delcominette.[67]

Against the robust reading looms a serious worry over the internal coherence of formally determinate privations. Let us go through a survey of cases.

There are at least some cases in which a substantial range may seem to resemble the continuum stretching between two contraries identifying a range. Controversial as believing in degrees of substantiality is,[68] (at least) some substantial forms seem to be possess a continuous structure that can be assimilated to that of a continuous range identified by a pair of contraries. For example, the form of human being seems to allow to be possessed on a certain degree or another along the process of development of an adult human being. The starting point of the generation of a human being (the menses) possesses the form of human being in a merely potential way, but are completely deprived of it in actuality. The stages of development of the human being stretching from the embryo, through the child, to the adult human being[69] may be seen as possessing and realising the form of the human being on ascending degrees starting from an extremely limited possession of it in the embryo and reaching to the complete possession of it in the adult human being.

In some sense, the degrees of possession of the form of human being build up a continuum stretching from the complete privation proper to the menses to the complete possession proper to the adult human. Such a continuum of the possession of the substantial form of human being may be seen as resembling the non-substantial range stretching between two contraries. The substantial range of human being stretches from a formally determinate privation of the form of human being (the menses), through determinate degrees of possession of the form of human being (the embryo, the child…), to the complete possession of the form of human being in the adult.

Even if we were to accept this reconstruction of the degrees of substance, its identification with the non-substantial ranges of contrary pairs is open to objections. Once we get to the bottom of the range of human being, is the complete privation of human being something determinate or

[66] Charles 2000.
[67] Delcominette (forth.)
[68] For a recent defence: Cohen 1996, cf. *Introduction*.
[69] Or rather, shamefully, to the adult man.

not? The menses are a certain determinate being other than white, smooth, air, grass, which do not qualify as sources of the human being.

On the one hand, it is evident that the menses (a) are endowed with the complete privation of the form of human being and (b) possess a certain formal determinacy and properties that make them what they are and that account for their capacity to become the human being. On the other hand, the formal determinacy of the menses has a problematic status, and the relation between (a) and (b) is far from clear.

To put it briefly, it is not clear whether the formal determinacy of the menses coincides with the complete degree of privation of the form of human being ((a)=(b)) or whether the form of the menses is different from the privation of the human being ((a)≠(b)). Reformulating this, it is not clear whether the form of the menses is a degree of the form of human being (i.e. the complete privation of it) or whether it is an independent form.

If ((a)≠(b)) the privation of the human being does not coincide with the form of the menses, then we have no reason for believing that the privation of the human being is something determinate. The form of the menses would be the set of features and the conformation proper to the proximate matter of the human being (the menses), whereas the privation of the human being would amount to the mere absence of the form of the human being from the menses. As such, privation would be the mere negation or the absence of the form.

If, on the contrary, ((a)=(b)) the privation of the human being coincides with the form of the menses, then privation is a positive, formally determinate, single item opposite to a determinate form, and the homogeneity with the contrariety model laid down in the previous section is safeguarded.

This latter possibility is nevertheless both exposed to general worries concerning the doctrine of the degrees of substance (i.e. of substantial form) and to particular difficulties concerning the identification of a positive degree of the form of human being (the form of the menses) with the complete privation thereof.

With relation to the former issue, the idea that the form of the menses is a degree of the form of human being may carry a threat to the doctrine of the unity of the form: if the form of human being allows for degrees, how can it be one? Difficulties concerning the relation of the form of

the matter of the human being (the menses) with the form of the accomplished human being may also arise. What is, in general, their relation to each other? Does the form of the menses cease to be when the form of the human being supervenes? Does it, at least to some extent, endure through the generation of the human being?

With relation to the latter issue, it is in general unclear how the absence of a form may identify with the possession of another form. The menses possess a determinate formal configuration (if not a full-blown form) and a determinate capacity (that of becoming a human being). How may a privation, namely the negation and absence of a form, coincide with a positive and determinate nature such as a form? In this connection, the privation of the human being seems to be more likely to be the absence and negation of the human being inhering in the menses than the positively-charged form of the menses.

Moreover, the case of the privation of the human being and of the form of the menses may be considered as a privileged case, for, as in the case of the contraries, it seems to entail the opposition of a single one form (of the human being) to a single one privation (the one in the menses). In fact, the human being comes into being from a single determinate source, the menses. In other cases, such as the previous examples of the statue and of the house, the privation of a certain form does not seem to identify with a positive, single one formal determinacy.

Let us consider the generation of a formed being such as a statue and the generation of a composite being such as the house. The statue comes to be from the marble, the house from a set of determinate parts and components that are in a disordered state before their ordered composition takes place. The marble and the set of parts and components of the house are not merely formless: the marble may be a perfectly squared cube or a lump of raw matter. In both cases, the marble has a formal configuration and determinacy, be it more or less orderly and shaped. In both cases, be it a cube or a lump, the marble is deprived of the form of the statue. In both cases, the cube and the lumpness yield the form of the statue.

Thus, if (a=b), the privation of the statue would coincide with indeterminately many positive shapes and degrees of shapedness. But this is an implausible consequence, and contradicts the supposed homogeneity between contrariety and substantial opposition.

Moreover, the single one, particular formal determinacy inhering in the marble before the statue has been sculpted is irrelevant to the final form of the statue. Regardless whether the marble be a perfectly-squared cube or an irregular lump of matter, the form of the statue will be shaped out of it. The only requirement for a certain conformation of the marble to yield the form of the statue is that the marble does not already possess the form of the statue (i.e. the otherness requirement). (One might speculate that there are limit cases in which a particular formal determination of the marble might prevent a determinate form to be carved into it. For example, a 3-feet-high statue of Aphrodite cannot be carved into a 2-feet-high block of marble. Even if this objection were pertinent – and I think it is not, for it regards the quantity and not the form of the matter – it would not suffice to solve the difficulty.)

The same results seem to hold for the case of the house. There may be indefinitely many instances in which the same particular components of the house (bricks, windows, cement…) are in a state of dividedness or lack of composition. Whatever formal configuration the material parts of the house may assume, if we endorse that (a=b), the following consequences mar the supposed homogeneity between substantial opposition and contrariety. First, form/privation are not in a one-to-one relation as contraries are. Second, the formal configuration of the matter is irrelevant to the generation of the form of the house.

I believe that these conceptual difficulties cannot be answered in a theoretically satisfying way. If, then, (a)≠(b) (i.e. if the positive determinacy of the menses does not coincide with the privation of the form of man), the robust homogeneity claim between substantial and non-substantial change does not hold.

I believe that Aristotle is tempted to endorse the robust reading of the homogeneity claim concerning the non-substantial and substantial opposites, as this is the most plausible interpretation of 188b18-19. That Aristotle has arguments for this stronger reading is something I doubt about, but I believe that there is a way of saving the homogeneity claim at least partially. I propose here a weaker reading of the homogeneity claim.

The weaker reading of the homogeneity claim states that there is a similarity, but not an identity, between the contrariety model of non-substantial change and the form/privation model of substantial change. I believe that it is possible to safeguard the range determinacy interpretation of SC^{nc} without endorsing that substantial privations are single one, determinate features. The

range determinacy condition, in the case of substantial change, can be safeguarded by reference to form alone. Whether we endorse the theory of the degrees of substance or not, it seems sufficient for a substantial range to be individuated that its form alone is something determinate, regardless its privation being determinate or indeterminate. In other words, with relation to the determinacy of the range of substantial change, the substantial form is necessary and sufficient, whereas the privation of the substantial form is irrelevant. If it is true, as I have claimed, that SC^{nc} identifies with the range determinacy condition, then the necessary and sufficient condition for natural change (SC^{nc}) is fulfilled, in the case of non-substantial change, by virtue of the determinacy of the form alone.

Unlike non-substantial ranges, whose determinacy rests on the horizontal, logical relation between each member of a contrary pair (difference condition), the determinacy of substantial ranges rests on the form alone. Nonetheless, if this is the case, the substantial opposites do not stand in any particular relation that identifies them as the relevant sources of substantial change. Rather, form and privation seem to fulfil only the necessary, insufficient otherness condition.

The weaker reading of the homogeneity claim is sympathetic with texts, such as *Phys.V.1*, that are less confident on a unified theory of substantial and non-substantial change. The main point of the *Phys.V.1* seems to be a differentiation of substantial and non-substantial change with relation to their respective sources. Non-substantial change occurs between contraries (H^+; H^-). Substantial change (coming into being/passing away) occurs between contradictories (A; ¬A). I discuss this text and its import on the source condition for substantial and non-substantial change in §5.4, where I argue that there is no identity, but only analogy, between the sources of non-sustantial change and the sources of substantial change.

2.3. The final step of Arg.2. The priority condition.

So far, Aristotle has assessed that the relevant sources of natural change are the contraries or their intermediates. Argument 2 of *Phys.I.5* finds its conclusion in 188b21-6, which introduce the priority condition. Namely the requirement that, among the sources of natural change, only those that are primary qualify as the principle of natural change. Thus, according to the basic notion of principle provided in *Metaph.V.1* (cf. §0.3.1.), 188a30-b8 (cf. §2.1.) selects the sources of natural

change. 188b21-6 refines this result, by selecting the subset of the *primary* sources of natural change.

The priority condition ([b]) is introduced by [a] the recapitulation of the results of the source condition, namely that the sources of natural change are the contraries and their intermediates. [c] contains the result of Arg.2, reached through the application of both the source and priority conditions: contraries are principles of natural things with relation to change.

> *Phys.*, I.5, 188b21-6
>
> [a] εἰ τοίνυν τοῦτ' ἔστιν ἀληθές, ἅπαν ἂν γίγνοιτο τὸ γιγνόμενον καὶ φθείροιτο τὸ φθειρόμενον ἢ ἐξ ἐναντίων ἢ εἰς ἐναντία καὶ τὰ τούτων μεταξύ. [b] τὰ δὲ μεταξὺ ἐκ τῶν ἐναντίων ἐστίν, οἷον χρώματα ἐκ λευκοῦ καὶ μέλανος· [c] ὥστε πάντ' ἂν εἴη τὰ φύσει γιγνόμενα ἢ ἐναντία ἢ ἐξ ἐναντίων.
>
> [a] In conclusion, if this is true, what comes to be comes to be and what ceases to be ceases to be out of a contrary into [its corresponding] contrary, or any of the intermediates between them. [b] The intermediates, nevertheless, are out of the contraries, for instance the [other] colours are out of white and black. [c] Therefore, the things that come to be by nature are either contraries or out of contraries.

A reasonable reconstruction of Arg.2 is the following:

> [a] SC^{nc} = A and B qualify as sources of natural change, iff $A=H^+$ (or $i^{H+/H-}$) and $B=H^-$ (or $i^{H+/H-}$); or iff $A=H^-$ (or $i^{H+/H-}$), $B=H^+$ (or $i^{H+/H-}$).
>
> [b] Priority condition = But $i^{H+/H-}$ derive from H^+/H^-.
>
> [c] Therefore (ὥστε), only H^+/H^- qualify as principles of natural change.

The source condition of natural change stated in [a] is refined into [c] by virtue of a brief argument contained in [b]. The priority condition in play in [b] prescribes that: if two sources of natural change S^1 and S^2 are given, and if S^2 derives from S^1, then only S^1 qualifies as a principle (or primary source) of natural change.

Now, [a] the sources of natural change are the contraries (H^+/H^-) and their intermediates ($i^{H+/H-}$). Nonetheless, [b] $i^{H+/H-}$ derive from H^+/H^-. Therefore, [c] $i^{H+/H-}$ fail to qualify as primary sources of natural change. In conclusion, only the contraries qualify as principles of natural change.

For instance, in the case of the range of colour, the intermediate colours such as magenta, cobalt blue and royal yellow are derived from the extremes of the range of colour white and black. For

each intermediate identifies with a certain degree of possession of one of the opposing features proper to their extremes white and black. Although the intermediate colours qualify as sources of natural change, they nevertheless fail to qualify as *primary* sources and principles.

Aristotle does not spell out, in [b], what it means for the intermediates to derive from the extreme contraries and what the priority of the extremes amounts to. The shift from verbs of motion, used through the whole Arg.2, to the verb εἶναι used in [b] makes plausible that Aristotle implicitly invokes the notion of ontological dependence and priority.

Intuitively, the intermediate degrees between any A and B do not exist as intermediates, if the extremes A and B do not exist in turn. To some extent, the notion of mixture or of participation helps clarifying the dependence of the intermediates on the extremes. At face value, $i^{A/B}$ can be interpreted as a mixture of A and B, or as participating of both A and B. The more of A is present in $i^{A/B}$ (and the less of B), the closer is $i^{A/B}$ to A within the range A-B. If this model captures the nature of the intermediates, then the extremes are ontologically primary with relation to the intermediates, for the intermediates do not exist in absence of the extremes, but the extremes exist in absence of their intermediates.

According to a different model, the contraries are prior to the intermediates with relation to their essence and definition. Magenta can be defined as the colour endowed with a certain degree of the capacity to widen sight comprised within the maximum degree possessed by white and the minimum degree possessed by black. Therefore, magenta is defined with relation to its extremes, but the extremes white and black are not defined with relation to magenta.

In conclusion, as the intermediates are dependent on and derived from the contraries (i.e. from their extremes), [c] only the contraries qualify as principles of change. In fact, [c] states, what undergoes change is either a contrary (namely a principle) or is derived from a contrary (namely is a product of change and/or an intermediate source that does not qualify as a principle).[70]

[70] This is of course not the only way of interpreting [c]. The advantage of my interpretation of [c] lies not only in its instrumentality in the reconstruction of Arg.2. Also, the conclusion of the survey on the predecessors (188b26-189a10, see §2.4.), in the last sentence of *Phys.I.5* (199a9-10), states that the principles of natural change are the contraries. Now, it is reasonable to hold that the conclusion of the survey must be the same as the conclusion of Arg.2, since the stated purpose of the survey (188b26-30) is to show that the predecessors generally agree with Aristotle on the principles of natural change. Thus, [c] must mean most likely that the principles of change are the contraries.

The general conclusion of Arg.2 in *Phys.I.5* is that the source condition of natural change (SC^{nc}) must be integrated into the primary source condition of natural change (PSC^{nc}). As I have claimed, SC^{nc} can be spelled out most likely into the range determinacy condition, which is linked with the logical concept of difference. If A is extremely *different* from B, A and B yield a range. Thus, PSC^{nc} can be spelled out as the extreme difference condition:

> PSC^{nc} = extreme difference condition = A and B qualify as sources of natural change, iff A and B are maximally different = iff A and B belong to the same range, and iff there is neither a C that is more distant from A than B, nor a D that is more distant from B than A.

2.4. The result of *Phys.I.5* and the survey of the theories of the predecessors on the principles of natural things.

The general conclusion of *Phys.I.5*, stated at the beginning of the chapter and restated twice in the following passage, is compared to the doctrines of the predecessors. The survey of the doctrine of natural principles, I have claimed, is hardly presented as an argument. Rather, Aristotle is primarily interested in pinpointing the partial failure of his predecessors, and secondarily in drawing external support from the partial truth they grasped, although indistinctly and without argument.

> *Phys.*, I.5, 188b26-189a10
>
> μέχρι μὲν οὖν ἐπὶ τοσοῦτον σχεδὸν συνηκολουθήκασι καὶ τῶν ἄλλων οἱ πλεῖστοι, καθάπερ εἴπομεν πρότερον· πάντες γὰρ τὰ στοιχεῖα καὶ τὰς ὑπ' αὐτῶν καλουμένας ἀρχάς, καίπερ ἄνευ λόγου τιθέντες, ὅμως τἀναντία λέγουσιν, ὥσπερ ὑπ' αὐτῆς τῆς ἀληθείας ἀναγκασθέντες.
>
> διαφέρουσι δ' ἀλλήλων τῷ τοὺς μὲν πρότερα τοὺς δ' ὕστερα λαμβάνειν, καὶ τοὺς μὲν γνωριμώτερα κατὰ τὸν λόγον τοὺς δὲ κατὰ τὴν αἴσθησιν (οἱ μὲν γὰρ θερμὸν καὶ ψυχρόν, οἱ δ' ὑγρὸν καὶ ξηρόν, ἕτεροι δὲ περιττὸν καὶ ἄρτιον ἢ νεῖκος καὶ φιλίαν αἰτίας τίθενται τῆς γενέσεως· ταῦτα δ' ἀλλήλων διαφέρει κατὰ τὸν εἰρημένον τρόπον), ὥστε ταὐτὰ λέγειν πως καὶ ἕτερα ἀλλήλων, ἕτερα μὲν ὥσπερ καὶ δοκεῖ τοῖς πλείστοις, ταὐτὰ δὲ ᾗ ἀνάλογον· λαμβάνουσι γὰρ ἐκ τῆς αὐτῆς συστοιχίας· τὰ μὲν γὰρ περιέχει, τὰ δὲ περιέχεται τῶν ἐναντίων. ταύτῃ τε δὴ ὡσαύτως λέγουσι καὶ ἑτέρως, καὶ χεῖρον καὶ βέλτιον, καὶ οἱ μὲν γνωριμώτερα κατὰ τὸν λόγον, ὥσπερ εἴρηται πρότερον, οἱ δὲ κατὰ τὴν αἴσθησιν (τὸ μὲν γὰρ καθόλου κατὰ τὸν λόγον γνώριμον, τὸ δὲ καθ' ἕκαστον κατὰ τὴν αἴσθησιν· ὁ μὲν γὰρ λόγος τοῦ καθόλου, ἡ δ' αἴσθησις τοῦ κατὰ μέρος), οἷον τὸ μὲν

μέγα καὶ τὸ μικρὸν κατὰ τὸν λόγον, τὸ δὲ μανὸν καὶ τὸ πυκνὸν κατὰ τὴν αἴσθησιν. ὅτι μὲν οὖν ἐναντίας δεῖ τὰς ἀρχὰς εἶναι, φανερόν.

As I have stated previously, also most of the other [thinkers] – roughly – go along with me with relation to what I have claimed so far. For they all claim that the elements and what they call principle are the contraries, even though they fail to provide arguments [for their claim], but rather [endorse it] as if they had been constrained by truth itself.

And [the predecessors] differ from each other [α] by virtue of the fact that some of them endorse contraries that are prior, whereas some others endorse contraries that are posterior; [β] some of them endorse contraries that are more knowable through thought, whereas some others endorse contraries that are more knowable through sensation. For instance, some [of the predecessors] endorse as causes of coming to be [α] hot and cold, while others endorse moist and dry; and [β] some endorse odd and even, while others endorse hate and love. And these differ from each other in the way that I have explained.

In conclusion, they [the contraries endorsed as causes of coming to be by the predecessors] can be said in a way identical to each other, and in another way different from each other. Different, as appears to most people. Identical in as much as they are analogous [to each other]. For they are taken from the same pair of columns of opposites [*systoichia*]. And for [α] some of the contraries contain [the others], whereas others are contained. With relation to this, [the contraries endorsed as causes of coming to be by the predecessors] are said to be both identical and different, and some are worse and some are better [in qualifying as principles]. And [β] some [contraries] are more knowable through thought and some through sensation, as has been said beforehand. In fact, what is a whole is known through thought, whereas what is related to the singular is known through sensation, for thought is of the whole, whereas sensation is of what is related to the parts. For instance, the Great and the Small are related to thought, whereas the dense and the rare are related to sensation.

In conclusion, it is evident that the principles must be contrary.

The survey of the theories of the predecessors on the principles of natural change is introduced (188b26-30) by an assessment of the similarity between Aristotle's view and the views of the predecessors. This similarity is qualified as a rough one (σχεδόν), thus entailing a certain degree of dissimilarity.

The similarity seems to lie in the general claim that all predecessors held that contraries are principles of natural change. The reason for the dissimilarity apparently lies in the superior level of abstraction gained by Aristotle over his predecessors.

Each predecessor is said to have endorsed one or more couples of contraries as principles of natural change. This endorsement does not gain, in the predecessors, the level of universality assured by the possession of a λόγος, i.e. of the argument or the principle underlying the view

endorsed. The view endorsed by each predecessor rather imposes itself on them due to its intuitive self-evidence, so that it is impossible to overlook it altogether. At the same time, a complete grasp of the self-evident truth is said to have eluded the other philosophers.

Each of the doctrines held by the predecessors are partial, for they select one particular couple (or more couples) of contraries as the primary source and principle of natural change. Thus, the predecessors endorse particular instances of the universal truth underlying them.

The argument or principle underlying the doctrines of the predecessors is that the contraries are natural principles, as 189a9-10 states literally, or rather that the principles are contrary, as the general conclusion of *Phys.I.5*. The two versions of the claim are not identical. I think that the latter is the conceptually more abstract version of the former, namely the result of Aristotle's analogical abstraction of the doctrines of the predecessors. In some way, the second claim and the result of is the same as the analogical generalisation of the doctrine of the predecessors, only on a higher level of abstraction.

The doctrines of the predecessors with relation to the principles of natural change can be more or less close to truth with relation to two features of the contraries selected as principles, namely with relation to: [α] their being primary or posterior; [β] their being perceptible or rational. At least with relation to [α], there is little doubt that a doctrine selecting a primary couple of contraries, despite understanding the truth partially, nevertheless comes closer to the truth than a different doctrine selecting a posterior couple of contraries.

The doctrines of the predecessors, their individual differences notwithstanding, are nonetheless analogically identical. It is clear, in fact, that:

hot : cold = dry : moist = even : odd.

The contraries selected as principles are different both individually and specifically (i.e. with relation to [α] and [β]). The first and second couple of contraries are perceptible, and the former is prior to the latter. The third couple is rational. Nonetheless, the reciprocal relation between the members of each couple is the same, for the members of each couple are reciprocally contrary.

H^+	H^-
Hot	Cold
Dry	Moist
Even	Odd

The analogical unity of the individual couples of contraries endorsed by the predecessors as principles is the abstract, universal principle of natural change endorsed by Aristotle as a result of *Phys.I.5*.

CHAPTER 3. THE SUBSTRATE AS A PRINCIPLE. LIMITATIONS TO THE CLAIM THAT ONLY THE CONTRARIES ARE PRINCIPLES.

3.1. The aporia on the number of natural principles.

Phys.I.6 ends with a "serious aporia" concerning the question whether the principles of natural things should be confined to two, namely the contraries, or whether a third principle should be added to the count, namely the substrate. Before analysing the arguments in favour of the addition of the substrate, several structural features of the aporia in question should be discussed.

(1) The two horns of an aporia must be exhaustive. The opening lines of *Phys.I.6* (189a12-20) set the agenda of the chapter on answering the question of the exact number of natural principles.[71]

With a brief move, 189a12-21 refutes both the monism and the infinity of the principle. Since the contraries are principles (*Phys.I.5*); and since contraries are opposites, and there is nothing like a single opposite; then there cannot be one single principle. The refutation of the claim that there are infinite principles both employs new arguments and draws on the refutation of Anaxagoras' infinite principles presented in *Phys.*, I.4, 187a26-188a18.[72]

[71] *Phys.*, I.6, 189a11-2.
[72] The refutation ends with a general conclusion against positing infinite principles (*Phys.*, I.4, 188a17-8): βέλτιόν τε ἐλάττω καὶ πεπερασμένα λαβεῖν, ὅπερ ποιεῖ Ἐμπεδοκλῆς. "And it is preferable to posit a smaller and finite [number

Having assessed that principles have to be of a finite number bigger than one, Aristotle provides two arguments (*Phys.*, I.6, 189a21-b1) in favour of the view that the principles are three in number (the contraries and the substrate).

Phys., I.6, 189b18-27 rules out that the finite number of principles may be bigger than three by showing that neither a further substrate nor a further couple of contraries should be added to the three aforementioned principles. By ruling out the necessity to posit four principles (i.e. two substrates and two contraries) or five principles (one substrate and two couples of contraries), the argument a fortiori rules out the necessity of a number of principles bigger than five.[73]

In conclusion, the horns of the aporia on the number of principles are exhaustive.

(2) In standard aporias, the two horns are not only exhaustive, but contradictory and thus mutually exclusive (in the form of [A]/[¬A]). The arguments supporting one horn of an aporia, thus, standardly rule out the possibility of the other horn.

In the aporia in *Phys.I.6*, this is on the one hand the case and on the other hand not the case. On the one hand, the First and Second horn are contradictory, for the First horn claims [C**] that the principles of natural things are *only* the contraries, whereas the Second horn claims ¬[C**] that the principles of natural things are *not* only the contraries.[74]

On the other hand, the second horn both rules out the First horn and endorses a weaker version of it. In fact, the Second horn states [C*] a weak, non-exhaustive version of [C**]: [C*] the principles are (also) the contraries.

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of principles], as Empedocles did." *Phys.I.6* echoes the preceding refutation in a selective way, namely retaining those that are valid for any theory contemplating infinite principles and dropping the arguments that dismiss details proper to Anaxagoras' theory.

[73] I do not analyse the interesting and complex arguments provided for this scope. It is nonetheless of some importance to point out that Aristotle, in refuting the possibility that there are more than three principles, does not hold for necessary to refute it altogether. Rather, Aristotle refutes the possibility that there may be something qualifying as a principle over the three mentioned, *on condition that* this something is either a contrary or a substrate. The possibility that there may be further principles that belong to a different kind or to different kinds of reality is not contemplated. The argument, thus, either calls for solid justification or must be downplayed as resting on the unwarranted dialectical premise that all predecessors posited as principles only contraries and substrates (cf. *Phys.I.4*).

[74] *Phys.*, I.6, 189a21-2 ἐπεὶ δὲ πεπερασμέναι, τὸ μὴ ποιεῖν δύο μόνον ἔχει τινὰ λόγον· "And as the principles are of a finite number, it is somewhat reasonable not to make them only two."

(3) The horns of the aporia in *Phys.I.6* can be presented as follows:

> First horn: [C**] the principles are only the contraries.
>
> Second horn: (¬[C**]) the principles are not only the contraries. Rather, the principles are [C*] the contraries and [S] the substrate.

The formulation of the aporia I suggest spells out the peculiar nature explored above. On the one hand, it secures the mutual exclusiveness of the two horns, for [C**] is the contradictory of ¬[C**]. On the other hand, it makes sense of the fact that choosing the Second horn entails accepting a weak version of the First horn, for [C*] is a weak version of [C**].

(4) The arguments supporting the Second horn, I claim, have two different and partially opposing features and effects.

(a) On the one hand, they partially harmonise with the arguments for the First horn, for they endorse [C*]. In fact, at least Arg.1 argues for [S] on the assumption that [C*] is true.

(b) On the other hand, the arguments of *Phys.I.6* undermine the claim that the contraries are principles not only in its robust version [C**], but also in its weak version [C*]. In §3.3, I show that Arg.2, in claiming for [S], undermines the validity of [C*]. If the contraries are metaphysically predicated of the substrate, then the claim of contraries to qualify as principles is threatened, for the substrate of metaphysical predication is prior to its predicates. Thus, Arg.2, in arguing for [S], also argues for the stronger and more threatening claim that

> [S>C] the substrate qualifies as a principle rather than the contraries.

Therefore, the Second horn is affected by internal difficulties, for [S>C] undermines the possibility of simply combining [C*] and [S].

(5) In substantiating the aporia on the number of natural principles raised at the end of *Phys.I.6*, I proceed to analyse the arguments for [S] provided by *Phys.*, I.6, 189a22-34.

In Chs.1-2, I have analysed the arguments of *Phys.I.5* for the claim that contraries are the principles of natural things. Both with relation to being (Arg.1) and to change (Arg.2), I have showed that Aristotle's intention in *Phys.I.5* is most likely to claim that contraries are *the only* principles of natural things.

I claim that [S] is argued for, in *Phys.I.6*, first with relation to change (Arg.1) and then with relation to being (Arg.2). Arg.1 and Arg.2 of *Phys.I.6*, thus, address respectively Arg.2 and Arg.1 of *Phys.I.5*.

The idea that Aristotle provides two arguments in 189a22-34 is far from being uncontroversial, as well as the reconstruction and meaning of these lines. Some evidence for my reading can be found in the lines following Arg.2.

> *Phys.*, I.6, 189a34-b1
>
> διόπερ εἴ τις τόν τε πρότερον ἀληθῆ νομίσειεν εἶναι λόγον καὶ τοῦτον, ἀναγκαῖον, εἰ μέλλει διασώσειν ἀμφοτέρους αὐτούς, ὑποτιθέναι τι τρίτον
>
> Therefore, if one considers truthful both the previous argument and this last argument, then, if one intends to save the validity of both of them, one will necessarily posit some third nature.

The two arguments mentioned are most likely to be found in the lines immediately preceding 189a34-b1, and in the lines following Aristotle's programmatic claim that he is going to argue against the view that there are only two principles (189a21-2). In other words, the two arguments mentioned in 189a34-b1 are most likely to be contained in 189a22-34.

This idea is opposed to the authoritative interpretation of Sean Kelsey (2008), who believes that the two arguments mentioned in 189a34-b1 must be identified with the reciprocally opposing arguments of *Phys.I.5* and *Phys.I.6*. If these are held true, they must result in the aporia denounced at the end of *Phys.I.6*.

Against Kelsey's interpretation of these lines, it can be objected that the consequence of the acceptance of the two arguments they state is not the occurrence of an aporia, but rather the necessity of positing the substrate as a principle. This result is the one announced in 189a21-2 and is pursues in the following lines. Thus, the two arguments mentioned in 189a34-b1 are most likely to be contained in 189a22-34, and are arguments in favour of [S].

3.2. Arg.1 of *Phys.I.6*. The contraries are not principles of change exhaustively (¬[C**]).

189a22-7 presents the first argument against [C**] from Arg.2 of *Phys.I.5*.

> *Phys.*, I.6, 189a22-7
>
> ἀπορήσειε γὰρ ἄν τις πῶς ἢ ἡ πυκνότης τὴν μανότητα ποιεῖν τι πέφυκεν ἢ αὕτη τὴν πυκνότητα. ὁμοίως δὲ καὶ ἄλλη ὁποιαοῦν ἐναντιότης· οὐ γὰρ ἡ φιλία τὸ νεῖκος συνάγει καὶ ποιεῖ τι ἐξ αὐτοῦ, οὐδὲ τὸ νεῖκος ἐξ ἐκείνης, ἀλλ' ἄμφω ἕτερόν τι τρίτον.
>
> For one may puzzle over how density may, by nature, make [*poiein*] rarity into something [else], as well as over how this [rarity] [may, by nature, make] density [into something else]. And the same [holds] also for the rest of contrariety. For neither does Love gather Hate and produce [*poiein*] something out of Hate, nor does Hate [produce something] out of Love. Rather, both Love and Hate act on [*poiein*] a third different thing.

Arg.1 of *Phys.I.6* has the form of a reductio. Its strategy is to show that, if we posit one contrary pair as the only principle, then a difficulty concerning the possibility of change (line 22, ἀπορήσειε) arises. The solution of this difficulty consists in positing a third principle different from the contraries (ἕτερόν τι τρίτον). A possible reconstruction of the argument is the following.

> If [C**] dense and rare were the only principles of change, then
>
> [a] The dense would be what comes to be rare in t^2. If this were the case, then
>
> [b] There would be a time t^2 in which the dense is rare,
>
> [c] Since what comes to be persists through change.
>
> But [b] is impossible, for [d] dense and rare are incompossible. Therefore, ¬[b]. Therefore, ¬[a]. Therefore, ¬[C**]. Instead, [e] there must be an ἕτερόν τι τρίτον.

The language and the topic of Arg.1 of *Phys.I.6* make clear that it tackles directly Arg.2 of *Phys.I.5*, for it refutes the possibility that the contraries are the only principles of natural change. As a matter of fact, Arg.1 of *Phys.I.6* picks from Arg.2 of *Phys.I.5* both the ἐκ-language and the expressions related to change. For instance, ποιεῖν πέφυκεν in lines 23-5 occurs also in *Phys.*, I.5, 188a32-3.

In the previous section, I have labelled Arg.1 of *Phys.I.6* "a mild reductio". What I mean with this is that Arg.1 of *Phys.I.6* does not refute the claim of Arg.2 of *Phys.I.5 tout court*. In fact, if Arg.1 of *Phys.I.6* were to refute [C*] altogether, it would be unclear why the aporia on the

number of principles does not take the form of a one vs two aporia (i.e. the contraries vs the substate), but rather a two vs three aporia. Arg.1 of *Phys.I.6* rejects the exhaustiveness of the conclusion of Arg.2 of *Phys.I.5* ([C**]), but preserves and endorses it in its basic form, namely that [C*] the contraries are principles of natural change. In fact, the argumentative strategy of Arg.1 of *Phys.I.6* is to argue that, if we assume that [C*] the contraries are principles of natural change, then we must also accept an additional principle, the substrate.

Now, neither the nature of the difficulty regarding [C**] nor the argument grounding the mild reductio are spelled out. The absence of any explicit explanation makes it plausible to assume that the rationale for the difficulty should rest on a self-evident principle of Aristotelian philosophy. I suggest that Aristotle may plausibly detect an infringement of the principle of non-contradiction, in the case in which the sources of natural change were only the contraries H^+ and H^-. This diagnosis of the difficulty posed by Arg.2 of *Phys.I.5* rests on three features:

(1) The entanglement between the concepts of: (a) the source of change (the starting point and the end point of change); (b) what changes (or the subject of change).

(2) The incompossibility of the contraries H^+ and H^-.

(3) The requirement that the subject of change must persist through change.

(1) It is important to keep in mind that, in Arg.2 of *Phys.I.5*, the contraries qualifying as principles are designated mostly by substantive adjectives such as τὸ λευκόν, "the white" or "what is white". These designations are ambiguous, for they stand both for the properties (e.g. the property of being white) and for the things that are endowed with these properties (e.g. a particular white thing). In the former case, "the white" refers to (a) the starting point of the process of becoming black; in the latter case, "the white" refers to (b) the subject changing from white to black. For instance, the white undergoing the event of tanning by virtue of its exposure to sunlight is, in the jargon of Arg.2 of *Phys.I.5*, both (a) the starting point of the event of tanning (i.e. the property of being white) and (b) the thing that undergoes the event of tanning (e.g. the skin that is white at t^1 and comes to be black at t^2). As I show in Ch.5,[75] it belongs to the endeavours of *Phys.I.7* to clarify what, within the complex concept of "the white", is the

[75] Cf. mainly §5.3. and §5.5.2.

substrate of change (i.e. the thing that is white) and what is the source of change (white as a property).

(2) The contraries H^+ and H^- always belong, respectively, to one of the two members of the contradictory pair $H^+/\neg H^+$ (whereas $H^+/\neg H^+$ do not belong to H^+/H^-). Therefore, H^+ and H^- are incompossible.

(3) In order for incompossibility to raise and for my reconstruction to work, the contrary that is (1b) the subject of change and (1a) that out of which change starts must be assumed to persist through change. Namely, what is white at t^1 and gets tanned at t^2 must be assumed to persist as such (as white) at t^2, in order for contradiction to occur. Such an assumption is a controversial one, but I do believe it can be defended against its critics, and that is endorsed in *Phys.I.7*.[76]

According to this scenario, if (1) H^+ is both (a) a contrary source of change and (b) the subject of the process of change between H^+ and H^-; if (3) H^+ persists as such once it has come to be H^-; and if (2) H^+ and H^- are incompossible; then, there is a time t^2 in which H^+ is H^-. But this is impossible. For, either there would be nothing that has undergone change at t^2 (for the starting point of change has been annihilated by the end point of change) or the principle of non-contradiction would be infringed (for the end point of change would be at the same time H^+ and H^-). Since [C**] is shown to lead to an impossible consequence, it must be false.

For instance, adopting as an example the principles of Anaximenes, it is impossible for rarity and density act on each other, if [C**] there is no third principle different from the contraries. Density will not make rarity dense and rarity will not make density rare. Rather, each will make a third principle different from the contraries either rare or dense.

By showing that the conclusion of Arg.2 of *Phys.I.5* faces absurd consequences with relation to the possibility of change, Arg.1 of *Phys.I.6* concludes is that ¬[C**] a couple of contraries cannot exhaust the set of the principles. Rather, a third principle different from the couple of contraries must be posited alongside them.

The meaning of [e] the solution of the aporia is unclear. On the one hand, we expect ἕτερον to refer to contrariety in general, and the ἕτερόν τι τρίτον to be [S] a substrate [Alterity condition]

[76] Cf. §5.6.

that is not itself a contrary. According to this reading, the argument would refute [C**] in general, namely that the contraries are the only principles of natural things.

On the other hand, the argument, as it stands, does not seem to secure the conclusion we expect it to pursue. In fact, it seems rather to analyse a narrow sense of [C**] such as the one endorsed by many predecessors. Namely, that only a determinate pair of contraries (dense/rare or Love/Hate are the principles of natural things. If this is the case, Arg.1 does not seem sufficient to rule out a possible scenario according to which a pair of contraries $H1^{+}/H1^{-}$ acts on a third contrary $H2^{-}$ (or $H2^{+}$) different from $H1^{+}/H1^{-}$. According to the latter scenario, ἕτερον would refer to a particular pair of contraries undergoing change, and the result of the argument would clearly not rule out [C**] in its general sense, but only in its particular sense.

Let us assume Anaximenes' scenario. If we posit dense and rare as the primary contraries out of which all other contraries derive, then, in order for change between the dense and the rare to occur, we must assume that [e] there is an ἕτερόν τι τρίτον on which the dense and the rare act. Nonetheless, it is left undetermined whether this ἕτερόν τι τρίτον be itself a contrary or a non-contrary substrate.

This conclusion, nonetheless, is too weak to justify the doctrine of the three principles argued for in *Phys.I.7* claiming that [S] the substrate is a principle and [Alterity condition] is not itself an opposite.

Other texts, such as *GC.II.1*, make the case for an ultimate, indeterminate (i.e. non-contrary) matter common to all natural things.[77] *Phys.I* does not draw a distinction between proximate and remote (or remotest, i.e. primary) matter, although we may assume that he has the latter in mind, given that he tackles the first substrate and the first contraries of his predecessors.

In fact, if the proximate matter of change were at stake, Arg.1 would not escape the possibility that the ἕτερόν τι τρίτον be itself a contrary, so that, when $H1^{+}$ changes into $H1^{-}$, the the ἕτερόν τι τρίτον may be any other chance contrary $H2^{+}$.

If, instead, the primary matter underlying all natural things and their contraries were at stake, Arg.1 would yield the expected result. Let us assume that the matter underlying the change between $H1^{+}$ and $H1^{-}$ were the primary matter underlying all natural things and their contraries.

[77] Cf. 4.2.2.3.4.

If the primary matter coming to be all contraries were itself a particular contrary (e.g. $H2^{+}$), then matter would allow for the contradictories to coexist whenever it changes into its contrary ($H2^{-}$). Since this is impossible, primary matter [Alterity condition] must be different from contrariety.

Although it is possible that Aristotle has this argument in mind, Arg.1 most probably tackles dialectically a particular inconsistency deriving from a particular endorsement of the predecessors. Namely from a narrow version of [C**]: a particular pair of contraries are the only principles of change of natural things. Accordingly, the nature of the ἕτερόν τι τρίτον solving the aporia on the possibility of change is intentionally left indeterminate.

In conclusion, the main effects of Arg.1 are three. First, rejecting [C**] with relation to change. Second, in making this, endorsing its weaker version [C*]. Third, assessing the necessity of a third principle alongside the contraries, leaving its nature indeterminate.

3.3. Arg.2 of *Phys.I.6*. The contraries are not principles of being exhaustively (¬[C**]).

Phys., I.6, 189a27-34 challenges the conclusion of Arg.1 of *Phys.I.5* that the contraries are the only principles of natural things with relation to their being. The relation between the two arguments is evident on two grounds.

First, the language of the argument is reminiscent of a terminology related first and foremost to the being and to the ontological constitution of things: the expression τῶν ὄντων οὐσίαν ([c]) and the formula εἶναι + ἐκ ([i]).

Second, in two places, the argument seems to take up Arg.1 of *Phys.I.5*.[78] [d-g] seem to address the capacity of contraries to fulfil the priority condition of [COS], by showing there is something more primary than the contraries, namely the substrate. Moreover, in order to make sense of [i], we need to add a premise similar to [a'] from Arg.1 of *Phys.I.5*: [H3] everything is composed out of the contraries.

A general issue with relation to the scope of Arg.2 of *Phys.I.6* must be tackled. It is clear that its main scope is to refute [C**] with relation to the being or ontological composition of natural

[78] *Phys.*, I.5, 188a27-8: δεῖ […] τὰς ἀρχὰς μήτε ἐξ ἀλλήλων εἶναι μήτε ἐξ ἄλλων, καὶ ἐκ τούτων πάντα: "The principles must […] [b] not be out of each other, [c] nor out of anything else, and [a] everything must be out of the principles."

things. This scope is achieved by arguing that [C**] is faced with two aporias that must be taken to be insoluble. Nonetheless, refuting [C**] does not amount straightaway to arguing for [S]. In fact, [S] features in Arg.2 as a premise ([f]), rather than as a conclusion.

With relation to the substrate and its capacity to qualify as a principle, Arg.2 makes two different claims that have two different imports on the capacity of the contraries to qualify as principles.

[S] The substrate is a principle;

[S>C] The substrate is a principle *rather than* the contraries.

In Arg.1 of *Phys.I.6*, Aristotle had refuted [C**] and endorsed [C*] that the contraries are principles of natural things (non-exhaustively).

Arg.2 of *Phys.I.6*, instead, alongside endorsing [S], not only refutes [C**], but also poses a threat to [C*]. For endorsing [S] seems to entail that [S>C] the contraries fail to qualify as principles, for the substrate is prior to the contraries, and principles are prior. In a nutshell:

[S] is incompatible with [C**], but compatible with [C*];

[S>C] is incompatible with both [C**] and [C*].

In conclusion, endorsing [S], on the one hand, solves certain difficulties for the ontological constitution of natural things deriving from positing [C**]. Since [S] undermines [C**], but not [C*], it may seem that the result of Arg.2 is the endorsement of the Second horn of the aporia on the number of principles.

On the other hand, it appears that, once we endorse [S], a stronger version thereof necessarily follows, namely ([S>C]). And since [S>C] undermines not only [C**], but also [C*], the Second horn of the aporia appears to be internally problematic. For, the Second horn claims that [S] and [C*] are both true, but once we endorse [S], [C*] cannot be true, for [S>C].

The aporia on the number of principles is thus a severe one, for Args.1-2 conclude that neither the First horn ([C**]) nor the Second horn ([S] and [C*]) are viable options.

Phys., I.6, 189a27-34

πρὸς δὲ τούτοις ἔτι [a] κἂν τόδε τις ἀπορήσειεν, [b] εἰ μή τις ἑτέραν ὑποθήσει τοῖς ἐναντίοις φύσιν· [c] οὐθενὸς γὰρ ὁρῶμεν τῶν ὄντων οὐσίαν τἀναντία, [d] τὴν δ' ἀρχὴν οὐ καθ' ὑποκειμένου δεῖ λέγεσθαί τινος. [e] ἔσται γὰρ ἀρχὴ τῆς ἀρχῆς· [f] τὸ γὰρ ὑποκείμενον ἀρχή, καὶ [g] πρότερον δοκεῖ τοῦ κατηγορουμένου εἶναι. [h] ἔτι οὐκ εἶναί φαμεν οὐσίαν ἐναντίαν οὐσίᾳ· [i] πῶς οὖν ἐκ μὴ οὐσιῶν οὐσία ἂν εἴη; [l] ἢ πῶς ἂν πρότερον μὴ οὐσία οὐσίας εἴη;

Moreover, [a] one may encounter further difficulty, [b] if one does not posit a different nature underlying the contraries. [c] For we see that the contraries are not the substance of any of the beings; and [d] it is necessary that a principle be not predicated of any substrate, [e] for in that case there would be a principle of a principle. [f] For the substrate is a principle, and [g] it seems to be primary with relation to what is predicated of it. Moreover, [h] we say that substance is not contrary to substance. [i] How can a substance ever be out of non-substances? [l] Or how can a non-substance be prior to a substance?

In what follows, I present a possible reconstruction of Arg.2. The structure of the argument is not transparent and requires the introduction of several hidden premises (that are indicated in my reconstruction by the letter H).

[b] If [C**], then [a] aporias will arise.

[H0] Aporia 1: The substance of things will be itself a contrary.

[c] = ¬[H0] But substance is not a contrary, for

[h] substance[1] is not contrary to substance[2]. And

[H1] substance[1] is not contrary to a non-substance.

[H2] For, if ¬[H1],

then two false consequences will arise ([i], [l]):

[i] (Natural) substances will be composed out of non-substances, since

[H3] = ~[a'] all natural things are composed out of the contraries (from Arg.1 of *Phys.I.5*).

[l] Non-substance will be prior to substance,

for [H3] and for

[H4] that out of which things are is primary with relation to the things composed out of it (i.e. the elements of X are prior to X).

[C1] [i] and [l] are false. Therefore, ¬[H2]. Therefore, [H1]. Since [H1] and [h], then [c]. Therefore, ⌐[H0]. Therefore, ⌐[C**].

[d] Aporia 2: Predicates will qualify as principles, for

[H5] the contraries are predicated of a substrate.

[e] If [d], then there will be a principle of a principle. For

[f] the substrate is a principle

[g] and the substrate is prior to its predicates, and

[H5]

[H2] and the principle is prior.

[C2] But ⌐[e]. Therefore, ⌐[d]. Therefore, ⌐[C**].

3.3.1. Subargument 1. If [C**], then [Aporia 1] the substance of natural things will be itself a contrary.

The first aporia arising from [C**] concerns the substance of natural things. If [C**] all natural things are composed exhaustively out of the contraries, then, by necessity, [H0] the substance of natural things is itself a contrary. [C**] necessarily entails [H0], for, once we assume that the contraries exhaust the realm of natural things, the substance of natural things must be itself a contrary. But substance is not a contrary; therefore, [C**] must be false.

According to my reconstruction, the structure of the refutation is the following. [C**] is refuted by virtue of ruling out its necessary consequence [H0]. [H0] is shown to be false, for [c] (its contradictory: “substance is not a contrary”) is shown to be true. For the two possible ways in which a substance may be a contrary are both ruled out. Namely, a certain substance cannot be

contrary either to [h] a different substance or to [H1] a non-substance. [h] is assumed as true.[79] [H1], instead, is demonstrated by virtue of reductio, namely assuming its contradictory ([H2]) and deriving two false, necessary consequences from it ([i], [l]). Having ruled out the two possible ways in which a substance may qualify as a contrary, [c] is shown to be true. Therefore, [H0] must be false. And since [H0] is a necessary consequence of [C**], [C**] must be false as well.

I expand briefly on the passages of the argument that are in need of further explanation.

Premise [H1] must be introduced in oder to explain the reference to non-substance made in the two aporias in [i] and [l], which refute the claims that substance is, respectively, constituted out of and primary with relation to non-substance.

[h] and [H1] represent the two possible, exhaustive ways in which [c] may occur. Since [H1] neither can a substance be contrary to a non-substance [h] nor a can substance be contrary to another substance, then [c] substance is not a contrary.

[i] is a necessary, false consequence of [H2] (the contradictory of [H1]) and is derived from it through the addition of [H3], a premise similar to the source condition of COS from Arg.1 of *Phys.I.5*. Namely, the claim that contraries are that out of which natural things are composed. [i] is evidently considered implausible enough not to require the effort of confutation. Regardless whether we understand non-substance in a categorical sense (as quality, quantity, relation…) or as nothingness, it is evident that [i] substance cannot be composed out of non-substance.

[l] can be derived from the aforesaid premises and from [H4] a self-evident principle of mereology resembling the priority condition of COS. As in the case of [i], [l] is not explicitly refuted. Regardless whether we understand non-substance in a categorical sense (as quality, quantity, relation…) or as nothingness, it is evident that [l] non-substance cannot be prior to substance.

Two points are worth making.

(1) Aporia 1 clearly take up material from Arg.1 of *Phys.I.5*. First and foremost, Aporia 1 stems from the assumption of [C**]. Second, [H3] takes up the source condition of COS, namely the

[79] Such as *Cat.5*, where it is nonetheless also assumed without further discussion. See §4.1.

claim that natural things are composed out of the contraries. Finally, [l] employs the concept of priority in play in COS. Thus, Aporia 1 clearly addresses Arg.1 of *Phys.I.5*.

(2) It is questionable whether Aristotle really believes that Aporia 1 cannot be solved. In fact, there seems to be a contrast between the rejection of the idea that substance is an opposite in Arg.2 of *Phys.I.6* and the result of *Phys.I.7*. In *Phys.I.7*, Aristotle posits form and privation as principles. Quite against [c], form and privation are substances, and are reciprocally opposed, although not in the same way as contraries are. Thus, according to *Phys.I.7*, there is a sense in which a substance is opposed – although not contrary – to another substance. If we reformulate the first subargument substituting "contrary" with "opposite", no aporia arises out of it.

Likewise, [i] the aporia concerning the idea that natural things are composed out of non-substances (i.e. privation) seems to posit no issue in *Phys.I.7*. In §5.5, I show that the substance representing the starting point of coming into being is composed out of matter and privation.

Considered within the conceptual framework of *Phys.I.4-6*, where the opposition between substance and non-substance coincides with that between primary substances and predicates of the *Categories*, Aporia 1 is an unescapable difficulty. If we consider the first subargument in the hylomorphic perspective of *Phys.I.7*, Aporia 1 does not arise at all.

3.3.2. Subargument 2. If [C**], then [Aporia 2] predicates will be principles.

A further necessary and false consequence arising from [C**] is presented in [d]. If the contraries were the only principles of natural things, then predicates would qualify as principles. For the contraries are always predicated of a substrate. And since the substrate is a principle and prior to the contrary predicates, assuming that the contraries are principles amounts to endorse that there is a principle of a principle. But this is false, for principles are something that is prior. Therefore, since the contraries are posterior to the substrate, the contraries do not qualify as principles, whereas the substrate does.

Let us consider again the scenario evoked by COS in Arg.1 of *Phys.I.5*. Let us assume P^1 is a principle of P^2, that both P^1 and P^2 are principles of [NT], the set of natural things. P^1 fulfils both the source and the priority condition with relation to P^2 and [NT], for P^2 and [NT] are

ontologically composed out of P^1, and there is no P^3 out of which P^1 is composed. Therefore, P^1 is a principle of P^2 and [NT]. P^2, instead, may seem to qualify as a principle of [NT], for [NT] is composed out of P^2. Nonetheless, P^2 fails to fulfil the priority condition, for it is in turn composed out of P^1. Therefore, P^2 fails to qualify as a principle.

With relation to the result of Aporia 2, three points are clear. First, as expected, [C**] is ruled out. Since [d] is a necessary and false consequence of [C**], [C**] is itself false. Second, against what might be expected, [S] does not belong to the results of the subargument. Rather, it is assumed as a premise ([f]). Third, Aporia 2 rules out not only [C**], but also its weaker version [C*]. Since the contraries are predicated of a substrate, they fail to qualify as primary, and therefore as principles. The substrate, instead, is predicated of nothing and exhibits the priority required to qualify as a principle. In short, the results of Subargument 2 are: ⌐[C**], for [S]; [S>C], therefore ⌐[C*].

The reconstruction of Subargument 2 meets several difficulties that threaten its validity.

The predicational priority of the substrate over the contrary predicates does not seem to square with the causal priority prescribed by COS. In COS, the priority relation is subordinate to the source relation. P^1 is prior to P^2, for P^2 is composed out of it, and P^1 is not composed out of P^2. In Arg.2 of *Phys.I.6*, the substrate is prior to the contraries in a predicational sense, whose import for the claim of the contraries to qualify as principles is not clear.

The nature of the relation of dependence of the predicates to their substantial subjects is controversial. A long-standing tradition has interpreted this dependency in a modal-existential sense, according to which P is dependent on S, if S is capable of existing separately, whereas P is not. This view is notoriously exposed to the counterfactual that no S can exist in absence of a certain number of Ps. Among other interpretations of the notion of dependence, Corkum's recent suggestion hinging on the possession of a certain ontological status seems particularly promising. According to Corkum, P is dependent on S, if S qualifies as a being without P, but P does not qualify as a being without S. For S does not exist in absence of a certain number of Ps, but is a being not in virtue of having P; whereas every P is a being only on condition that it pertains to at least one S.[80]

[80] Corkum 2008.

None of the aforementioned interpretations of dependence, nevertheless, seems to provide a rationale for the failure of the contrary predicates to qualify as principles. For the priority relation of COS that is relevant to causality is subordinate to the source relation, whereas predicational priority is not.

This difficulty may call either for a different interpretation of the priority condition of COS or for serious doubt over the validity of Subargument 2. As a matter of fact, the result of the argument leading to Aporia 2 is not endorsed in *Phys.I.7*. This may lead us to prefer the second option.

A further reason for doubt over the validity of the argument is the use of coincidental metaphysical predication as a key to understand the relation between the opposite and the substrate. It is clear that, in the case of

[CMP] (Coincidental metaphysical predication): S is H^+,

S is prior to H^+, for S is a substance and H^+ is a non-substance. In the case in which the opposites are the substantial form and its privation endorsed in *Phys.I.7*, nonetheless, this proposition does not hold. Thus, [CMP] cannot describe the relation among matter, form and privation. For the way in which these latter two are predicated of the former one is evidently not the way in which non-substantial properties are predicated of substances.

Thus, Aporia 2 is faced with a row of problems. Does the priority of the substrate of [CMP] entail a full-fledged causal priority of the substrate over the contraries? (That is to say, if contraries are metaphysically predicated of the substrate, how may the substrate be an element of them?) Does the metaphysical priority of the substrate entail that the contraries are reducible to the substrate? Does coincidental metaphysical predication exhaust the relation of metaphysical dependence between the substrate and the contraries?

At least some of these questions find an answer in *Phys.I.7*, where the material provided by the arguments in *Phys.I.5-6* – the opposites and the substrate – is reshaped according to their metaphysical and causal relations. The result of the long argument of the initial section of the chapter, that programmatically undertakes the task of solving the "2 vs 3 aporia" of *Phys.I.6*, does not seem to allow for the possibility to causally reduce the opposites to the substrate. Instead, the message of *Phys.I.7* seems to be that the substrate and the opposites are causally on

the same footing, although, metaphysically, they might not be, for the substrate is primary, whereas the opposites (or at least the negative opposite, privation) comes to coincide with the substrate. Nonetheless, *Phys.I.7* provides an aporetic answer to the question whether the substrate be primary over the positive opposite (i.e. the form) or the other way round. Apparently, further questions concerning the core of hylomorphism are postponed to other writings.

In conclusion, Subargument 2 has two different and contrasting effects with relation to the aporia on the number of principles.

First, [S] undermines its First horn, namely [C**]. Once the substrate has been introduced as a third different nature from the contraries, and as a principle of being, the First horn of the aporia on the number of principles is ruled out.

Second, Subargument 2 poses a threat also to the Second horn of the aporia, for it undermines the claim [C*] that contraries qualify as principles *tout court*. For Subargument 2 hinges on [CMP], and [CMP] entails [S>C] that the substrate is a principle rather than the contraries (for the substrate is prior to the contrary predicates, and the principle is prior).

A serious doubt looms on the validity of Subargument 2, both because [CMP] does not seem to describe the relation between matter and substantial opposition in the full-fledged hylomorphic perspective of *Phys.I.7*, and because the concept of priority entailed in [CMP] does not seem to be causally relevant.

3.4. Args.1-2 and their effect on the aporia on the number of natural principles.

The horns of the aporia on the number of natural principles raised at the end of *Phys.I.6* can be presented as follows:

> First horn: [C**] the principles are only the contraries.
>
> Second horn: (¬[C**]) the principles are not only the contraries. Rather, the principles are [C*] the contraries and [S] the substrate.

I have endorsed that the aporia arises from a contrast between Args.1-2 of *Phys.I.5* (arguing for the First horn) and Args.1-2 of *Phys.I.6*. On the backdrop of my reconstruction of the aporia, I first briefly summerise how each of its claims is argued for throughout Args.1-2 of *Phys.I.6*. Then, I expand on the relation between the various claims and show why the aporia they constitute is a serious one. Namely, why it is not possible to simply endorse either the First horn or the Second horn.

As their introduction anticipates, Args.1-2 of *Phys.I.6* are primarily meant to undermine the conclusion of Args.1-2 of *Phys.I.5* that [C**] the contraries are the only principles of natural things. I have claimed that Arg.1 does so in a dialectical way, by refuting a narrow version of [C**] endorsed by his predecessors (that a certain pair of primary contraries are the only principles). The scope of Arg.2 is to refute the broad version of [C**], for it addresses the claim of Arg.1 of *Phys.I.5* that natural things are exhaustively composed out of contraries. Arg.2 shows that there is at least something, namely natural substances, that cannot be reduced to contrariety. Thus, Arg.2 undermines the first premise of COS argued for in Arg.1 of *Phys.I.5*, namely the claim that contraries are the exhaustive ontological components of natural things:

[a**] all natural things are exhaustively composed out of the contraries.

Arg.1 clearly endorses [C*] as a premise. Subargument 2 of Arg.2, in arguing that [S>C], rules out that contraries are principles [¬[C*]).

Concerning the necessity of positing a substrate, we must distinguish between two different claims.

[S] The substrate is a principle of natural things.

[S>C] the substrate is a principle rather than the contraries.

[S] is to some extent anticipated in Arg.1. Nonetheless, in arguing that an ἕτερόν τι τρίτον must be posited as a principle alongside the contraries, Aristotle omits to further qualify the nature of the third principle, although it is obviously a placeholder for the concept of a non-contrary substrate. Arg.2 first introduces the concept of substance and clarifying the failure of contraries to qualify as such (Subargument 1); then, it introduces the substrate as a substantial subject of predication for non-substantial contraries (Subargument 2). In doing so, Arg.2 makes clear that

the substrate and the contraries belong to different categories of being: the substrate is a substance; the contraries belong to the non-substances or coincidental properties. Thus, Arg.2 endorses that – at least in the non-hylomorphic perspective opened by [CMP] – the substrate is not a contrary.

[S>C] derives from understanding the relation between substrate and contraries against the backdrop of the relation between substances and non-substances. Namely, according to [CMP]. If the contraries are predicated of the substrate, then they fail to exhibit the priority proper to the principles and fail to qualify as such. Thus, Subargument 2 of Arg.2 undermines [C*].

The reciprocal opposition of the aforementioned claims shape the aporia on the number of principles into a serious one. At a close examination, in fact, neither of the horns presents a viable choice.

As I have claim, the main aim of Args.1-2 of *Phys.I.6* is to undermine the First horn ([C**]) of the aporia on the number of principles. This aim is pursued with different scopes and in more or less convincing ways. Despite this, there is no doubt that Args.1-2 of *Phys.I.6* aim at demonstrating ¬[C**], thus undermining the First horn of the aporia.

This is, nonetheless, not the end of the story, for the Second horn does not confine itself to claiming for ¬[C**]. Rather, the Second horn consists of two positive claims: [S] and a weak version of the First horn [C*]: the contraries are principles (namely [C**] deprived of its exhaustiveness). Now, a certain degree of antinomy between [S] and [C*] makes the Second horn as a non-viable option as the First horn. For Subargument 2 of Arg.2, by virtue of endorsing both [S] and [CMP], undermines the claim of the contraries to qualify as principles (¬[C*]).

In conclusion, Args.1-2 of *Phys.I.6* score an aporetic result. On the one hand, they explicitly refute the First horn of the aporia ([C**]), by endorsing [S] a substrate different from contrariety.

On the other hand, in endorsing [S] in its stronger version [S>C], they endorse: [C*] and "[S>C], therefore ¬[C*]", thus undermining the internal validity of the Second horn ([C*] and [S]).

Thus, the effect of Args.1-2 of *Phys.I.6* is an aporetic one, for the arguments rule out both the First and the Second horn of the aporia on the number of principles. The solution of the aporia on

the number of principles in *Phys.I.7* is achieved on several layers. First, *Phys.I.7* shows in which cases the First horn and the Second horn are valid. Second, in order for the Second horn to be viable, *Phys.I.7* must take position with relation to the priority issue stated in [S>C]. This second task is left undecided with relation to the form and the substrate. The riddle over the priority of either the form or the matter is a vibrant one in Aristotle's philosophy. Providing an adequate answer to it entails differentiating the various meanings of priority and a nuanced answer. *Phys.I* does not embark on it, but is rather content with showing that the third principle, namely privation, is posterior with relation to both the form and the matter of the end point of change, i.e. the substance that has come into being.

Before reaching *Phys.I.7* and solution of the aporia on the number of natural principles, I devote the next chapter to the analysis of the relation between the substrate and contrariety in the remaining section of *Phys.I.6* and throughout the *Corpus*. *Phys.I.5* has suggested that the contraries exhaust the realm of natural things. The arguments of *Phys.I.6* aim at refuting this idea by making conceptual space for a substantial substrate different from the contraries.

The necessity for the substrate to be different from the contraries is, nonetheless, not as evident as we would wish. Arg.1 does not show it conclusively, if not from a dialectical point of view. Arg.2 makes a stronger case for it, by appealing to the concept of substance and to the failure of the contraries to qualify as such. This is, again, not decisive, for the prosecution of the argument of *Phys.I.4-6* into *Phys.I.7* posits as principle a pair of opposites from the contraries, namely form and privation, and these extend within the category of substance. Thus, if we reformulate [C**] into

[C##] the principles are only the opposites,

where the term "opposite" includes both the contraries and the substantial opposition of form and privation, the validity of Args.1-2 of *Phys.I.6* is threatened. For neither it is true that a substance is not opposite to a substance (Subargument 1) nor is matter predicated of form/privation according to [CMP] (Subargument 2). In the next chapter, I analyse the relation between opposition, substrate and matter, in order to assess whether the latter two can be reduced to the opposites.

4. SUBSTANCE, CONTRARIETY AND OPPOSITION IN ARISTOTLE'S *CORPUS*.

For most of its part, this chapter provides a diversion from the text of *Phys.I*, but not from its topic, since I analyse the relation between substance and contrariety or opposition.

The First horn of the aporia on the number of natural principles raised in *Phys.I.6* endorses that reality can be reduced to contrariety. This option is one that Aristotle evidently takes seriously, not only because the Second horn of the aporia is affected by internal difficulties, but also because, to some extent, Aristotle seems to endorse the possibility of reducing reality to contrariety.

There is some reason for doubting that the possibility of reducing reality to contrariety is faced with more counterfactuals than only substance. Evidence from the *Categories* denies that quantities may qualify as contraries (considering only the categories implied in change: substance, quality, quantity and place). With relation to quantity, I here confine myself to flagging the issue.

Substance is explicitly addressed in Arg.2 of *Phys.I.6* as an exception to [C**]. In the following pages, I will enquire whether substance is really an exception to [C**] or to its broader version

[C##] the principles are only the *opposites*.

The *Categories* provide the most clear-cut answer to the topic, and it is a negative one. Neither primary nor secondary substance, Aristotle claims in *Cat.5*, are contraries. I discuss these claims in §4.1.

Notoriously, the conceptual machinery employed in the *Categories* does not contemplate hylomorphism, i.e. the analysis of substance into matter and form. With relation to natural substances, which are hylomorphic compounds, the analysis of the *Categories* represents a first-layer analysis that must be complemented with the hylomorphic analysis. Therefore, the enquiry on the relation between substance and contrariety or opposition must answer the questions whether form (§4.2.1.) and matter (§4.2.2.) are contraries/opposites or not.

My first result is that the former question can be answered affirmatively. On the one hand, form does not appear to fulfil the conditions for qualifying as a contrary; on the other hand, every form is opposed to a privation.

My second result is a negative one. First, I analyse three key texts in order to show how the doctrines of the predecessors were unclear with relation to the nature of matter (§4.2.2.1-2.) As both *Phys.I.4* and *Phys.I.6* show, the predecessors, on the one hand, understood the need to posit a third principle alongside the contraries. On the other hand, most of them failed to properly delimit matter from contrariety, positing as primary matter one or more of the four elements, which are in turn contraries.

This having been ascertained, I turn to analyse the relation between the four elements and contrariety in *GC.II.1-5* (§4.2.2.3.) I believe that this is a privileged position for assessing the issue, both because the four elements are the primary material constituents of the natural world and because they are essentially characterised by the four primary contraries hot/cold, dry/moist. If, as some modern interpretations contend, the four elements are nothing more than the primary contraries defining them, then matter is a contrary. Against this view, I show that the four elements are compounds of the primary contraries and of a primary substrate common to all four elements. The primary substrate, which I label "primary matter" in order to distinguish it from the traditional prime matter, is necessarily intertwined with contrariety, but is in itself non-contrary, for it is what it is only potentially. Thus, primary matter does not exist actually as an indeterminate being, which would be absurd; rather, it exists actually only as a contrary element. Nonetheless, since it is what it is only potentially, it is different from the contraries and represents an exception to [C**] and [C##].

4.1. Substance and contrariety in the non-hylomorphic analysis of the *Categories*.

The text from *Cat.5* I discuss makes two claims with relation to substance and contrariety, namely that neither [a] primary substance (Michael Jordan) nor [b] secondary substance (man as an abstract) has a contrary.

> *Cat.*, 5, 3b24-27
>
> Ὑπάρχει δὲ ταῖς οὐσίαις καὶ τὸ μηδὲν αὐταῖς ἐναντίον εἶναι. Τῇ γὰρ πρώτῃ οὐσίᾳ τί ἂν εἴη ἐναντίον; οἷον τῷ τινὶ ἀνθρώπῳ οὐδέν ἐστιν ἐναντίον· οὐδέ γε τῷ ἀνθρώπῳ ἢ τῷ ζῴῳ οὐδέν ἐστιν ἐναντίον.

> And it also belongs to substances that nothing is contrary to them. [a] For what would be contrary to a primary substance? For instance, there is nothing that is contrary to an individual man. [b] And to man or to animal, as well, there is nothing that is contrary.

Aristotle does not provide any argument for his claims [a] and [b], whose truth he probably believes to rest on their (alleged) self-evidence. A plausible rationale for these claims can be found in the impossibility for both [a] primary substances and for [b] secondary substances to qualify as maximal differences.

Contrariety is defined in numerous passages as the maximal difference within a genus.[81] H^+ is contrary to H^-, iff H^+ and H^- belong to the same genus G and H^+ is maximally different from H^-, such that there is no Z that is more different from H^- than H^+. Let us consider the genus of colour. Within the continuous spectrum of colours, white is contrary to black, for both white and black belong to the genus of colour, and for there is no colour that is more different from black than white. For white possesses the maximal capacity to broaden sight and black possesses the maximal contrary capacity, i.e. the maximal capacity to narrow sight. All other colours are intermediate between white to black and can be ordered in a continuous series according to their relative degree of possession of one capacity or of the other. For example, cobalt blue will place itself very close to black within the continuum of colour, whereas lemon yellow will place itself very close to white. Cobalt blue possesses the capacity to narrow sight to a certain degree, whereas black possesses it maximally; lemon yellow possesses the capacity to broaden sight to a certain degree, whereas white possesses it maximally. Neither cobalt blue nor lemon yellow qualifies as contraries, for none of them possesses the capacity to broaden or narrow sight to a maximal degree, as white and black do. Rather, cobalt blue and lemon yellow are intermediate between the contraries white and black.

Now, one is not likely to find anything that qualifies as the maximal difference of [a] Michael Jordan or of [b] man within the genus of animal.

For, [a] why should a worm, a stone, a chair be contrary to Michael Jordan? A stone and Michael Jordan can have contrary qualities (one may be cold and the other hot, one animate and the other inanimate…), but the substance of Michael Jordan will not oppose to the substance of a stone as a contrary.

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[81] *Cat.*, 6, 6a11ff; *Metaph.X.4*.

Similarly, [b] two secondary substances do not oppose as contraries, for substances such as the man or the worm or the dog do not seem to qualify as maximal differences within the genus of animal. How could the man qualify as the maximal difference of any other species within the genus of animal?

A doubt might be raised whether the substances S^1 and S^2 may be said to be contraries in virtue of the contrariety of their *differentiae specificae*. Let us consider a case in which that S^1 and S^2 may seem to have contrary differentiae. For example, man is rational and worm is irrational.[82] This case of opposition might appear as an instance of substantial maximal difference, for rationality and irrationality seem to be maximally different, and for each of them individuates the substance of man and of worm. Without being rational, man would not be such; without being irrational, worm would not be such. Do man and worm, on account of their respective rationality and irrationality, qualify as contrary primary/secondary substances? This view can be rejected.

Even if we were to assume the principle[83] "if Y and Y are substrances and have contrary differentiae, then X and Y are contrary substances," still we are not likely to be able to identify one single determinate differentia (D^-) that satisfactorily qualifies as the contrary of a given differentia (D^+). For example, assuming that man possesses a certain kind of rationality (D^+), will there be a determinate kind of irrationality that is contrary to man's rationality and thus qualifies as D^-? If the particular D^- that is contrary to D^+ cannot be identified, then everything that is utterly irrational (acacia, stone, worm…) will be contrary to the man, which is false, for every H^+ has only one H^-.

Let us accept provisionally the hypothesis that there are degrees of rationality, such that, for example, god possesses the maximal degree of rationality; the adult man possesses a somewhat smaller degree of rationality and the young man possesses an even smaller degree thereof. Once we get to the bottom of this scale, i.e. to utter irrationality, we lack a criterion for distinguishing a determinate kind of irrationality that qualifies as D^- (i.e. as the determinate contrary of D^+) from

[82] I here use articles before nouns in the following way: indefinite article (e.g. "a man") to signify [a] primary substances; definite article (e.g. "the man") to signify [b] secondary substances; no article ("man") to signify both primary and secondary substances.

[83] I believe that Aristotle must be committed to this principle in some cases, for he endorses that the four elements are reciprocally contrary by virtue of possessing contrary properties (hot/cold, dry/moist) *essentially*. Nonetheless, it is controversial whether the four elements merit the status of substances. For an overview on this long-standing controversy, D'Angelo 2007.

a kind of irrationality that does not qualify as D^-. Does the irrationality proper to the worm qualify as the D^- that is contrary to the D^+ of the man? Or rather, is the irrationality proper to the stone that qualifies as D^-?

These questions are unlikely to find a positive answer: once we have reached the bottom of the degrees of rationality, it seems impossible to select a determinate kind of irrationality that is contrary to man's rationality. Most plausibly, irrationality, when it is referred to acacia, worm and stone, is merely meant to qualify the complete absence of the positive feature of being rational that is common to all three items. If this is true, irrationality is an indeterminate property, under which indeterminately many instantiations of the complete lack of rationality fall.

If this is true, it seems impossible to choose any single instance of irrationality (viz. that of acacia) over another once (viz. that of worm) as the determinate D^- that is contrary to the determinate D^+ of man. Even if we were prone to accept the aforementioned principle that two substances are contrary, if their respective *differentiae specificae* are contrary to each other, we are nevertheless not likely to be able to individuate any two determinate *differentiae specificae* qualifying as contraries. Hence, we are not likely to find any two primary or secondary substances that are opposed to each other as contraries.

In conclusion, *Cat.5* attests that neither [a] primary substances nor [b] secondary substances are contraries.

4.2. Hylomorphic compounds and contrariety.

The claim of *Cat.5* that substance has no contrary is not the end of the story. The relation between substance and opposition must be answered from a hylomorphic perspective, for it is the perspective that Aristotle pursues in *Phys.I.*

Since the hylomorphic compounds are analysable into matter and form, and as both matter and form have claim to qualify as substances, we need to specify whether matter and form are reducible to contrariety/opposition or not.

My conclusion is that, from a hylomorphic perspective, substance as form is reducible to a certain kind of opposition (namely, that of form/privation). Substance as matter, instead, is not reducible to opposition.

4.2.1. Form and opposition.

I claim that Aristotle conceives of a form of opposition for substance, in particular one for substantial forms. The opposition of form and privation, however, differs from the opposition of contrariety and applies to the category of substance.

The opposition of form and privation does not seem to identify with contrariety. For H^+ is contrary to H^-, if (1) H^+ and H^- belong to the same genus and if (2) H^- is maximally different from H^+. 2-feet-long and black neither (1) belong to the same genus (2) nor are maximally different (for only what fulfils (1) can also fulfil (2)). Yellow and black (i.e. the colour possessing the capacity to narrow sight maximally) both belong to the genus of colour, thus fulfilling the first condition for qualifying as contraries. Nevertheless, yellow is not maximally different from black, for yellow possesses only partially the capacity to broaden sight that is contrary to the capacity to narrow sight proper to black. White, instead, possesses the capacity to broaden sight to a maximum extent, thus qualifying as the contrary of black.

A corollary of this is that both H^+ and H^- must be *single determinate* degrees of a certain capacity, quality or feature.

In the case of substance, if a privation F^- is opposed to a form F^+, then neither the condition (1) that F^- and F^+ must belong to the same genus nor the condition (2) that F^- must instantiate one determinate maximum degree of difference from F^+ seems to hold.

(1) Form and privation may seem not to fulfil the first condition for qualifying as contraries, for it is questionable that F^+ and F^- do belong to the same genus G. Let us consider the form of man (F^+) and the privation of the form of man (F^-). Both the menses (i.e. the matter out of which the man is generated) and the corpse after death has occurred are deprived of the form of man. In the former case, the privation of the form of man inheres in the remote matter of man, the menses; in

the latter case, the privation of the form of man inheres in the proximate matter of the man, the human body.

When the form of man is lacking, neither the menses nor the corpse belong to the same genus as the man, for none of them is a living being. The menses are not yet a living being, for they are alive only potentially. The corpse is not a living being in actuality; moreover, it has even lost the capacity to be alive, to the extent that it is impossible to revivify a corpse. Thus, (at least in some cases) form and privation do not seem to belong to one and the same genus.

(2) The opposition of form and privation also does not seem to fulfil the second condition for qualifying as contrariety, for F^- does not instantiate a determinate maximum degree of difference from F^+. Let us consider the previous example. It does not seem the case that either the privation of the form of man in the menses or the one in the corpse may identify with H^-, i.e. with the determinate, maximum degree of difference from H^+. In fact, the privation F^- opposing to F^+ is said in many ways. In general, a natural thing can lack F^+ either to a certain degree or completely,[84] whereas H^+ is contrary to H^-, if H^- lacks H^+ completely.[85] Thus, if F^- lacks F^+ only to some degree and not completely, then F^- does not qualify as the contrary of F^+.

One could answer this argument by claiming that at least complete privation may be identified with contrariety, whereas incomplete privation may coincide with the intermediates between the contraries. However, not even this seems to be the case. H^+ has only one contrary, H^-, which coincides with the maximum degree of privation of H^+. The complete privation (F^-) of the form of man (F^+), unlike H^-, cannot be identified with a single determinate item. In fact, F^- is said in at least two different ways. In one sense, there is complete privation of the form of man in the menses before the man has been generated. In another sense, there is complete privation of the form of man in the corpse, i.e. when the proximate matter of man (the human body) has been deprived of the form of man, after the man has undergone corruption. These two instances of privation of the form of man cannot be two instances of the same way of being deprived, but that they are rather two different privations.

[84] *Metaph.*, V.22, 1022b32-1023a7.
[85] *Metaph.X.4*.

Let us look more closely at the complete privation (F^-) of the form of man (F^+) inhering in the menses and in the corpse. Both the menses and the corpse lack F^+ completely. Nonetheless, they do not seem to lack the form of man in the same way.

In the former case, the privation of F^+ does not seem to qualify the matter of man to any extent: the menses are a certain amount of matter endowed with such and such nature. The nature of the menses coincides with the positive features and capacity that are proper to the menses as a particular kind of matter (i.e. that is proper to the menses as they are such, and not marble or wood). The determinate, positive nature of the menses is unlikely to identify with the privation of the form of man inhering in the menses before fertilization has occurred and the man has been generated. The determinate nature of the menses that allows for them to generate a man and not, say, a horse, is the nature proper to the menses *as the proper matter* of the man, and not as the privation of the form of man.

The fact that privation is unrelated to the determinate nature of the matter of generation is shown by the fact that the corpse or the menses of the horse cannot generate a man, although they are both deprived of the form of man. Therefore, the capacity for the man is not proper to the privation of man, but rather to the relevant matter of the man. Thus, the privation of the man does not entail any positive determinacy.

In conclusion, I have claimed that substantial forms do not admit of contrariety. Nonetheless, they admit of opposition, for every form is opposed to a privation. The kind of opposition of form and privation cannot be identified with that of contrariety. For neither (1) each form and its privation belong to the same genus nor (2) privation qualifies as the determinate maximum degree of difference from its corresponding form.

Thus, with relation to [C**; C##], it is plausible to admit that all substantial forms have a privative opposite, for all substantial forms can either be present or absent, and the absence of a substantial form coincides with privation. *Phys.*, II.1, 193b18-21 substantiates this idea, in claiming that the formal cause is twofold, for form is both the positive form F^+ and its privation F^-, since "privation is to some extent a form."[86]

[86] *Phys.*, II.1, 193b18-20: ἡ δὲ μορφὴ καὶ ἡ φύσις διχῶς λέγεται· καὶ γὰρ ἥ στέρησις εἶδός πώς ἐστιν. Far from equating the status of form to the status of privation (πως), this passage attests with no restriction, and thus plausibly with universality, that a privation F^- corresponds to (every) form F^+.

4.2.2. Matter and contrariety.

As I have claimed, a major endeavour leading from the dialectical discussion of *Phys.I.4* to the Aristotelian doctrine of natural principles of *Phys.I.7* lies in the clarification of the relation between matter and opposition. Most of Aristotle's predecessors, in positing one of the elements as matter, had assumed that matter is essentially intertwined with contrariety, and thus to some extent itself a contrary. For instance, fire would not be fire if it were not endowed with hotness, and hotness is opposed to coldness, which in turn qualifies essentially water; thus, water is the contrary of fire. A few other thinkers had argued, instead, that matter must be a different nature from the contraries.

The traditional view about Aristotelian matter is that Aristotle also endorses the existence of an indeterminate matter as the primary substrate of all things (*prima materia* or prime matter). According to the traditional view, Aristotle's primary matter would resemble Plato's more than that of his other predecessors. If the traditional view is true, then matter is radically different from opposition, and the First horn of the aporia is false.

The endorsement of prime matter has been widely criticised in the last decades. The opinion that the primary substrate of all natural things coincides with the four elements has become nowadays predominant. If the modern view is true, then matter seems to be itself reducible to opposition and does not represent an exception to the First horn of the aporia.

In the following sections, I first provide a survey of the relation between matter and opposition attributed by Aristotle to his predecessors in *Phys.I.4* and *Phys.I.6*. Then, I discuss Aristotle's doctrine of the four elements in *De Generatione et Corruptione, II.1-5*, showing that he endorses an ultimate substrate of the four elements, which I call primary matter. Primary matter is not itself a contrary and represents thus an exception to the First horn of the aporia.

4.2.2.1. Matter and contrariety in Aristotle's survey of his predecessors in *Phys.I.4*.

In the opening of *Phys.I.4* (187a12-23), Aristotle classifies his predecessors into two main groups, each endorsing to some extent and in different versions the claim that natural principles

are the substrate and the contraries. This is the core idea that Aristotle wants to abstract from the various opinions held by his predecessors on the principles of natural thing.

The two groups of predecessors enlisted in *Phys.I.4* differ from each other with relation to (a) the number of substrate(s) they endorse; (b) the way in which the multiplicity of natural things is derived from the substrate; (c) the relation between the substrate and the contraries.

> *Phys.*, I.4, 187a12-23
>
> Ὡς δ' οἱ φυσικοὶ λέγουσι, δύο τρόποι εἰσίν. [1] οἱ μὲν γὰρ ἓν ποιήσαντες τὸ [ὂν] σῶμα τὸ ὑποκείμενον, ἢ τῶν τριῶν τι ἢ ἄλλο ὅ ἐστι πυρὸς μὲν πυκνότερον ἀέρος δὲ λεπτότερον, τἆλλα γεννῶσι πυκνότητι καὶ μανότητι πολλὰ ποιοῦντες (ταῦτα δ' ἐστὶν ἐναντία, καθόλου δ' ὑπεροχὴ καὶ ἔλλειψις, ὥσπερ τὸ μέγα φησὶ Πλάτων καὶ τὸ μικρόν, πλὴν ὅτι ὁ μὲν ταῦτα ποιεῖ ὕλην τὸ δὲ ἓν τὸ εἶδος, οἱ δὲ τὸ μὲν ἓν τὸ ὑποκείμενον ὕλην, τὰ δ' ἐναντία διαφορὰς καὶ εἴδη)· [2] οἱ δ' ἐκ τοῦ ἑνὸς ἐνούσας τὰς ἐναντιότητας ἐκκρίνεσθαι, ὥσπερ Ἀναξίμανδρός φησι, καὶ ὅσοι δ' ἓν καὶ πολλά φασιν εἶναι, ὥσπερ Ἐμπεδοκλῆς καὶ Ἀναξαγόρας· ἐκ τοῦ μίγματος γὰρ καὶ οὗτοι ἐκκρίνουσι τἆλλα.
>
> And from what the physicists said, there are two models. [1] The first group of physicists made the underlying body one, namely either one of the three [elements] or something else that is denser than fire but rarer than air. And from density and rarity they generate the rest, which they make many. And these [density and rarity] are contraries or, speaking generally, excess and defect. (Or, as Plato says, the Great and the Small. But Plato posited these as matter, and he posited the Form as the one. Instead, the physicists posited the underlying matter as the one, and the differentiae and the forms [they posited] as the one.) [2] The second group of physicists [endosed that] the contraries are separated out of the one in which they are contained, as Anaximander said, as well as those that made it [that out of which the contraries are separated] one and many, namely Empedocles and Anaxagoras. For they separated the rest out of the mixture.

The first group of predecessors ([1]) posited (a) one substrate and two contraries; the contraries (density and rarity) (b) act on the substrate, differentiating it into the existing multiplicity. According to the parallel texts *GC*, I.1, 314a7-13 and b1-6, this process of differentiation is accomplished through alteration, whereas the second group of predecessors endorsed division and aggregation.

This general scheme can be filled in differently with the details proper to each of the various doctrines held by the predecessors. With relation to the substrate, Thales endorsed water, Anaximenes air, Heraclitus fire; the thinker(s) endorsing the intermediate are, to my knowledge, always mentioned anonymously in Aristotle's *Corpus*. Aristotle's interest, however, lies in the general tripartite scheme, rather than in the details relative to each thinker.

Phys.I.4 remains uncommitted to the (c) the relation between the substrate and the contraries. The dialectical discussion of matter in *Phys.*, I.6, 189b2-11 further divides the thinkers of the first group into two subgroups with relation to (c). The thinkers endorsing the four elements assumed, on the one hand, a certain degree of difference between the substrate and the contraries, for they posited the substrate as a third principle besides the contraries. On the other hand, in positing one of the four elements as a substrate, they made the substrate a contrary itself, for the four elements are contrary to each other. Unlike the philosophers of the first subgroup, the thinker(s) endorsing the intermediate came close to understanding the alterity of the substrate, although Aristotle does not seem to concede her/them full recognition.

A short mention of Plato follows the presentation of the first group (lines 17-20). It is commonly considered as parenthetical; and this, I believe, with good reason. This notwithstanding, it is clear that Plato's position is to some extent the reverse of that of the first group of thinkers.[87] If the thinkers of the first group posited one substrate and two contraries, Plato identified the principle that is one with the form, and the substrate with the contrariety of the Great and the Small. It is plausible that Aristotle believes that Plato cannot be fully harmonised with any of the two groups presented in our passage. Nonetheless, he is mentioned parenthetically in order to highlight the fact that he also endorsed three principles, the contraries and the substrate, although a different model thereof.

If one were nonetheless to judge on (c) with relation to the brief mention of Plato in lines 17-20, it is clear that Aristotle attributes to Plato the belief that the substrate can be reduced to contrariety, for the Great and the Small are contraries. It is clear that a major critical target of *Phys.I.9* is Plato's belief that matter is a privative nature.[88] If this were true, Aristotle argues, the substrate would be annihilated in receiving the form, for form and privation are incompossible.[89]

The second group of predecessors (187a19-26) includes two subgroups. This internal partition has been consistently overlooked by Aristotelian commentators and interpreters of Anaximander, all too ready to oppose the thinkers of the first group to those of the second group as monists vs

[87] Cf. *Phys.*, I.9, 192a8-9: ὥστε παντελῶς ἕτερος ὁ τρόπος οὗτος τῆς τριάδος κἀκεῖνος.
[88] *Phys.*, I.9, 192a1-25.
[89] This result is valid for *Phys.I* and Aristotle's analysis of Plato's matter as the Great and the Small. Elsewhere, in analysing Plato's matter in the *Timaeus* (χώρα), Aristotle attributes to Plato the belief that matter is an indeterminate being radically different from contrariety. The question whether Plato holds one or two theories of matter, and the possibility to harmonise these two Aristotelian interpretations of Plato's matter, are not discussed in my work.

pluralists. Accordingly, Anaximander's *apeiron* has often been interpreted as a pluralistic mixture, and thus as composed out of the contraries. The distinction between monists and pluralists has recently lost its popularity among scholars; nonetheless, it is one that Aristotle endorses to a certain extent. The decisive point of the issue is to understand Aristotle's conceptual framework in presenting Anaximander's doctrine.

Anaximander is mentioned by Aristotle in a small number of passages. In two of them (*Phys.I.4* and *Metaph.*, XII.2, 1069b18-24), Anaximander's *apeiron* is compared to the mixture of Empedocles and Anaxagoras. Another passage is relevant for Aristotle's interpretation of Anaximander's doctrine: *Phys.*, III.4, 203b3-15. Although Anaximander is not explicitly mentioned, the reference to him is assured by the commentators and by a verbatim quotation of Anaximander.[90] Here, Aristotle interprets Anaximander's *apeiron* as a single one body separate from and devoid of contrariety.

There seems to be some internal tension between the first two passages, where the *apeiron* is mentioned along with Empedocles' and Anaxagoras' mixture of a multiplicity of contraries, and *Metaph.XII.2*, where the *apeiron* is said to be one and to be separate from the contraries. With relation to (a), the first two passages may seem to identify the *apeiron* with multiplicity, whereas the last passage declares it to be one. With relation to (c), the first two passages seem to endorse that the *apeiron* consists of the contraries, whereas the last passage claims that the *apeiron* is separate from the contraries.

I believe that a close analysis of the two main testimonies on Anaximander's *apeiron* can harmonise this apparent contrast.[91] I argue that, with relation to (a), the two groups of thinkers are partially identified and partially differentiated. For Anaximander's *apeiron* is one, whereas the material principles of the second group are both one (as a mixture) and many (with relation to the components of the mixture). With relation to (b), all the thinkers of the two subgroups believed that multiplicity is generated by virtue of a process of separation from the material principle.

[90] 12B3 DK. Several scholars accept also the words περιέχειν ἅπαντα καὶ πάντα κυβερνᾶν as an Anaximandrean quotation.
[91] *Metaph.XII.2* can be left aside, both because it is of minor importance and because its text and meaning are highly controversial.

Now, is the *apeiron* a mixture of contraries or not? If (b) the contraries came out of it, it is intuitively plausible that the answer to our question is positive. Nonetheless, (a) the *apeiron* is one, whereas the mixture of the second subgroup is said to be one and many. Evidently, the decisive point lies in (c) the relation between the contraries and the substrate (the *apeiron*).

I believe that it is possible to interpret the text of *Phys.I.4* as suggesting a loose similarity between the *apeiron* and the mixture of Empedocles and Anaxagoras. The claim that the contraries inhere in the *apeiron* (*Phys.*, I.4, 187a20) can be interpreted both in a strong sense (thus identifying the *apeiron* with a mixture) and in a weak sense (as a general statement that contraries are *in some sense* contained in the *apeiron*). The weak reading has three advantages. First, it harmonises *Phys.I.4* with *Phys.III.4*. Second, it explains why the *apeiron* is one and the mixture "one and many" (namely, because the *apeiron* is no mixture). Third, it harmonises with the most complete testimony on Anaximander's cosmogony that is in our possession, that of Pseudo-Plutarch (12A10 DK). According to Pseudo-Plutarch, the primary contraries of Anaximander's philosophy, the hot and the cold, are not contained in the *apeiron*, but rather generated out of an intermediate principle called γόνιμον. If this testimony is accepted as trustworthy, then the contraries do not inhere in the *apeiron*, but are rather contained in an intermediate principle, the γόνιμον, which is in turn separated out of the *apeiron*.

Further evidence can be gained through the analysis of the parallel texts *GC*, I.1, 314a7-13 and b1-6. The scope of *GC.I.1* is to distinguish two groups of physicists according to (b) their conception of change.[92] Namely, it distinguished between those who reduced change to alteration and those who reduced change to aggregation and separation. Further, it connects each mode of change with (a) an endorsement on the number of the material principle(s).

In a nutshell, *GC.I.1* divides the physicists into two groups. On one hand, those who identified substantial change with (b) the alteration of (a) a single one substrate. On the other hand, those who identified substantial change with (b) aggregation and separation out of (a) a substrate that is not one, but many.

The picture is consistent with that of *Phys.I.4*, and the thinkers belonging to each group are the same. Nonetheless, two differences in the presentation of the second group can be spotted. First,

[92] Since the processes of change here analysed are the processes in which plurality is derived from the substrate, I believe that they inform us on (b).

in *GC.I.1*, (a) the substrate is said to be many, instead of one and many. Second, once this reformulation is accomplished, *GC.I.1* drops the mention of Anaximander. Thus, if the substrate is not said to be one, then the identification between Anaximander's *apeiron* and the mixture of Anaxagoras and Empedocles ceases to be possible.

In conclusion, the similarity between the two subgroups composing the second group of the predecessors seems to be thinner than thought by most interpreters. On a closer look, it adds up to (b) the idea that the contraries are, in some way, separated out of the substrate (c) in which they, to some extent, inhere. The way in which the contraries inhere in the *apeiron* is, nonetheless, an indirect one, for they are actually generated by an intermediate principle, which in turn inheres in the *apeiron*. The contraries of Empedocles and Anaxagoras, instead, inhere directly in the primeval mixture out of which they are separated by virtue of, respectively, the action of Love and Hate, and of the Intellect. It is because of this difference with relation to (c) that Anaximander's substrate is said to be one, whereas the substrate of the second subgroup is one and many.

To conclude the survey on the predecessors in *Phys.I.4*, I briefly analyse the second subgroup. Most of *Phys.I.4* is devoted to Empedocles and Anaxagoras, and in particular to the confutation of the latter. This confutation is too specific for the aims of my analysis. I confine myself to contrast the position on (a-c) of the second subgroup with that of Anaximander.

The thinkers belonging to the second subgroup are differentiated from Anaximander with relation to (a) and (c), but are assimilated to him with relation to (b), for they all generate multiplicity out of the substrate through separation. As we have seen, with relation to (a), Anaximander posited the substrate as one, whereas Empedocles and Anaxagoras posited it as one and many. Plausibly, "one" refers to the substrate as a mixture, whereas "many" refers to the ingredients out of which the mixture is composed. With relation to (c), the second subgroup diverges from Anaximander, for Anaximander posited his *apeiron* as different and separate from the contraries, whereas the second subgroup identified the substrate with the contraries (i.e. with a mixture thereof). Thus, despite endorsing a plurality of substrates instead of a single one, Empedocles and Anaxagoras are assimilated to the first group with relation to (c), for they also identify the substrate with the contraries.

To be sure, there is some internal difference, within the second subgroup, with relation to the extent of this identification. First, with relation to the quantity of the kinds of components, Empedocles posited a finite number thereof, whereas Anaxagoras posited an infinite one.

> *Phys.*, I.4, 187a24-6
>
> διαφέρουσι δὲ ἀλλήλων τῷ […] ποιεῖν […] τὸν μὲν ἄπειρα, τά τε ὁμοιομερῆ καὶ τἀναντία, τὸν δὲ τὰ καλούμενα στοιχεῖα μόνον.
>
> And they [Anaxagoras and Empedocles] differ from each other in virtue of the fact that the former posits infinite [material components], namely the *homoiomeries* and the contraries, whereas the latter posits only the so-called elements.

Thus, with relation to (a), Anaxagoras and Empedocles are differentiated from the first group and from the first subgroup (Anaximander) for not endorsing a single one material principle. Furthermore, they are differentiated from each other for positing finite (Empedocles) and infinite (Anaxagoras) material components.

Second, the difference between Empedocles and Anaxagoras does not concern only the number of the material components of reality, but also the discussion on what the primary material component of reality is. In fact, Empedocles identified the primary material components of reality with the four elements; Anaxagoras with the *homoiomeries*.

With relation to (c), the second subgroup is assimilated to the first group and differentiated from Anaximander. This assimilation, nonetheless, reaches different degrees in Empedocles and in Anaxagoras with relation to their understanding of what the substrate of reality is.

> *Cael.*, III.3, 302a28-b3
>
> Ἀναξαγόρας δ' ἐναντίως Ἐμπεδοκλεῖ λέγει περὶ τῶν στοιχείων. Ὁ μὲν γὰρ πῦρ καὶ γῆν καὶ τὰ σύστοιχα τούτοις στοιχεῖά φησιν εἶναι τῶν σωμάτων καὶ συγκεῖσθαι πάντ' ἐκ τούτων, Ἀναξαγόρας δὲ τοὐναντίον· τὰ γὰρ ὁμοιομερῆ στοιχεῖα (λέγω δ' οἷον σάρκα καὶ ὀστοῦν καὶ τῶν τοιούτων ἕκαστον), ἀέρα δὲ καὶ πῦρ μίγματα τούτων καὶ τῶν ἄλλων σπερμάτων πάντων· εἶναι γὰρ ἑκάτερον αὐτῶν ἐξ ἀοράτων τῶν ὁμοιομερῶν πάντων ἠθροισμένον. [Text: Moraux 1965]
>
> With relation to the elements, Anaxagoras endorses a view that is opposite to Empedocles'. In fact, Empedocles claims that fire and earth and the others in the same series are the elements of the bodies, and that out of these all bodies are composed. Anaxagoras argues, instead, that the elements [of the bodies] are the *homoiomeries* (e.g. flesh, bones and such things), whereas air and fire are a mixture of these and of all other

seeds. For each of these [air and fire] consist of all the invisible *homoiomeries* gathered together [*lit.*: are what in itself gathers together of all the invisible *homoiomeries*].[93]

From *Phys.I.4*, we learn that Empedocles reduced the substrate of reality to the four elements, and thus to contrariety. Anaxagoras, instead, identified the substrate with the four elements and the *homoiomeries*. Nonetheless, *Cael.III.3* states that the four elements and the *homoiomeries* are not on an equal footing. Rather, Anaxagoras believed that the four elements are intermediate elements of reality, as they are in turn composed out of the *homoiomeries*. Thus, with relation to (c), Empedocles seems to reduce material reality to the contraries, whereas Anaxagoras does not, for he reduces it to the *homoiomeries*, and it is clear that at least some *homoiomeries* are non-contrary beings such as bones and flesh.

In conclusion, concerning (c) the relation between the contraries and the substrate, the predecessors show a strong tendency to identify the substrate with the contraries. This applies to the first group of thinkers, to Plato and to Empedocles. Anaxagoras endorse this identification partially. Anaximander, instead, endorsed a separation of the substrate from contrariety.

4.2.2.2. Substrate and contrariety in *Phys.I.6*. The Alterity condition.

In the *Phys.*, I.6, 189b2-11, Aristotle presents a survey of the doctrines of the predecessors on the substrate.

> *Phys.*, I.6, 189b2-11
>
> ὥσπερ φασὶν οἱ μίαν τινὰ φύσιν εἶναι λέγοντες τὸ πᾶν, οἷον ὕδωρ ἢ πῦρ ἢ τὸ μεταξὺ τούτων. δοκεῖ δὲ τὸ μεταξὺ μᾶλλον· πῦρ γὰρ ἤδη καὶ γῆ καὶ ἀὴρ καὶ ὕδωρ μετ' ἐναντιοτήτων συμπεπλεγμένα ἐστίν. διὸ καὶ οὐκ ἀλόγως ποιοῦσιν οἱ τὸ ὑποκείμενον ἕτερον τούτων ποιοῦντες, τῶν δ' ἄλλων οἱ ἀέρα· καὶ γὰρ ὁ ἀὴρ ἥκιστα ἔχει τῶν ἄλλων διαφορὰς αἰσθητάς· ἐχόμενον δὲ τὸ ὕδωρ. ἀλλὰ πάντες γε τὸ ἓν τοῦτο τοῖς ἐναντίοις σχηματίζουσιν, πυκνότητι καὶ μανότητι καὶ τῷ μᾶλλον καὶ ἧττον. ταῦτα δ' ἐστὶν ὅλως ὑπεροχὴ δηλονότι καὶ ἔλλειψις, ὥσπερ εἴρηται πρότερον.
>
> [[…] one will necessarily posit some third underlying nature], as did those who claim that everything is one certain nature, for instance water, fire and the intermediate between these. And the intermediate between these appears to have better [claim to qualify as the underlying nature]. For, fire and earth and air and water are intertwined with contrarieties. Therefore, it is not without reason that those [philosophers] make the substrate different from any of these [i.e. from any of the elements], or air among the

[93] Also: *GC*, I.1, 314a24-b1.

> other [elements], for air is the element which is least endowed with perceptible differences (and second comes water). But all of them shaped the one by means of the contraries – by means of density and rarity, of the more and the less; and these are namely, in general, excess and defect, as I have claimed before.

The survey presented in 189b2-11 does not purport to provide a comprehensive overview of the doctrines of the predecessors. Even if we confine ourselves to the number of thinkers discussed in *Phys.I.4*, Aristotle explicitly mentions only the thinkers belonging to the first group, namely those who posited the substrate as one determinate nature (water, air, fire) and the intermediate.

The survey rather has an argumentative role in the agenda of *Phys.I.5* and *Phys.I.6* culminating to the aporia on the number of principles. There is a tension between the *endoxon* of *Phys.I.4* that the predecessors endorsed a three-principles scheme including the contraries and one substrate and the claim endorsed in *Phys.I.5* that contraries are the only natural principles (First horn of the aporia). A plausible solution of this tension is to locate the decisive point on the riddle over the nature of the substrate as a third principle alongside the contraries. The gist of the aporia lies on whether the substrate should be reduced to the contraries or not.

If the substrate is a third nature different from the contraries, then the First horn of the aporia is dismissed, but we are confronted with the alleged internal inconsistency of the Second horn, which endorses both that contraries are principles and primary, and that contraries are not primary and therefore not principles.

If, rather, the substrate is reducible to the contraries, for it is identified with one (or more) of the positive four elements, and the four elements are intertwined with contrariety, then the First horn of the aporia is true, and contraries exhaust the set of the principles of natural things.

Accordingly, *Phys.*, I.6, 189b2-11 contrasts two views on the substrate. The first view is that the substrate is one of the contrary four elements. The second view is that the substrate does not identify with any determinate nature, and therefore also not with contrariety.

Aristotle does not confine himself to highlighting this contrast, but credits the second party with a superior, although partial, understanding of what the substrate is. The result of this confrontation with the predecessors is that the thinkers who identified their substrate with one of the elements failed to recognise its indeterminate nature. This failure of the predecessors

amounts to the failure to draw a clear dividing line between the contraries and the substrate. I refer to this as to the Alterity condition.

The idea of a substrate whose nature does not coincide with any of the positive, contrary features shaping reality is theoretically a difficult one. It has been probably endorsed for the first time, among the philosophers, by Anaximander of Miletus. If we consider Anaximander's *Apeiron* from the Aristotelian perspective, namely as a substrate, then the endorsement of the Indefinite by Anaximander is testimony of an alternative concept of matter and substrate. From a passage in which Aristotle is believed by Ancient commentators and modern scholars to unfold Anaximander's rationale for endorsing the Indeterminate as a principle, we learn that the never-ending process of reciprocal change and destruction occurring among the contraries would have led Anaximander to posit as a principle a nature that is independent and beyond the contraries. The idea of a primeval matter that is radically different from contrariety is not one that Anaximander's contemporaries and successors were prone to accept. Neither Anaximander's predecessor Thales nor his successors Anaximenes, Diogenes of Apollonia, Heraclitus, in Aristotle's understanding of their principles as matter, were ready to detach their speculation from their experience of reality and of the contrariety constituting it, postulating as a principle a pure indeterminate nature such as Anaximander's *Apeiron*.

As Anaximander's successors, modern scholarship has also found the idea of an indeterminate first substrate unappealing, and has rejected a long scholarly tradition on matter attributing to Aristotle the endorsement of an indeterminate prime matter as the ultimate substrate of reality. The idea that Aristotle's ontology may contemplate an item which is existing and devoid of any positive quality and contrariety constituting reality is admittedly a dubious one. Not only is the idea of an existing indefinite item contrary to experience; also, it violates one of Aristotle's basic requirements for substantiality, namely the requirement of being something determinate.[94]

In conclusion, 189b2-11 witnesses Aristotle's confrontation with two opposing views of matter and of the relation between matter and contraries.

On the one hand, the view that matter is something determinate and intertwined with contraries, for instance one of the elements. This is the view on matter underlying the First horn of the

[94] *Metaph.VII.3*; *Cat.5*.

aporia on the number of natural principles. If matter can be reduced to the contraries, then the contraries are exhaustive principles of natural things both with relation to being and with relation to change. Respectively, the idea that the contraries are the only principles of natural things raises a difficulty both with relation to the substance of things (for contraries are not substances) and with relation to the possibility of change (for contraries do not qualify as subjects of change).

On the other hand, the view that matter is something indeterminate. The indeterminacy of matter does not in itself amount to radical alterity from contrariety. Rather, it is presented by Aristotle as a scale. In its more radical version, matter is seen as non-intertwined and different from contrariety, such that it cannot be reduced to the contraries, but rather amounts to a third different nature from contrariety. This is the position on matter endorsed in the Second horn of the aporia on the number of natural principles raised at the end of *Phys.I.6*. Nonetheless, once it has been accepted, the claim of contraries to qualify as principles appears to be undermined, thus undermining also the consistency of the Second horn of the aporia itself. In fact, the claim of the substrate to qualify as a principle both rests on the claim that contraries are principles and undermines this claim.

A serious aporia, thus araises. I believe that the aporia on the number of natural principles is a serious one not only due to its formal features, but also because it affects Aristotle's doctrine of matter. Aristotle's doctrine of matter is, I believe, an attempt to reconcile the two opposing requirements mentioned above.

On the one hand, Aristotle endorses Empedocles' idea that the world (or, at least, the natural world) is composed out of the four elements as its basic constituents. Thus, matter is necessarily intertwined with contrariety, for the four elements are themselves contraries. If the four elements are the basic matter of the natural world, then the claim of the First horn of the aporia on the number of principles receives some justification, for it appears that matter itself can be reduced to contrariety.

On the other hand, the idea that matter is the ultimate substrate of all things substantiates the claim that matter is indeterminate. If the ultimate substrate were determinate, then its determinate features would conflict with the nature of the things composed out of it.

Aristotle's confrontation with and solution of this difficulty concerning matter is contained in a few chapters of the second book of *De Generatione et Corruptione*. As this text endorses Empedocles' theory of the four elements and discusses both them as contraries and as matter, I believe that this text represents a unique opportunity for a study of the relation between matter and contrariety. Although it may appear that (and although predecessors have endorsed that) the four elements are the simplest constituents of reality, Aristotle endorses the claim that they are in turn hylomorphic compounds. In fact, each of the four elements is composed out of one contrary out of each of the two pairs of primary contrarieties (hot/cold; dry/moist), and out of the primary substrate of reality, which is indeterminate and does not coincide with contrariety. The primary substrate is what the elements potentially are; the primary contraries are what the four elements are in actuality. As the indeterminate bearer of the primary contraries that is what it is only potentially, the primary substrate cannot be reduced to contrariety, and represents, thus, an exception to the First horn of the aporia on the number of natural principles.

4.2.2.3. Primary matter and primary contrariety in Aristotle's theory of the four elements. On *GC.II.1-5*.

Prime matter is one of the most controversial topics of Aristotelian scholarship. An enduring tradition has assumed that Aristotle is committed to the existence of an ultimate material substrate of all things, indeterminate and potential. This view has been criticised in the late 1950s and, more substantially, from the 1970s to nowadays. The core claim of the anti-traditionalists is that the ultimate material substance of reality is represented by the four elements fire, air, water and earth, which are simple beings and, as such, non-analysable into an alleged further substrate.

If the anti-traditionalists are right, then matter does not constitute an exception to the First horn of the aporia. If, instead, the traditionalists are right, then matter is something different from contrariety and opposition, thus ruling out the First horn of the aporia.

I analyse a crucial text for the controversy, *GC.II.1.5*. Against the traditionalists, I deny that this text provides any evidence for prime matter, namely for an ultimate, indeterminate material substrate *of all beings*. Against the anti-traditionalists, I show that Aristotle is committed to the

view that the four elements are hylomorphic compounds. As such, the four elements are composed out of an ultimate material substrate.

I enquire into the material substrate of the four elements, which I label "primary matter". I show how its invention in *GC.II.1-5* is Aristotle's assessment of two opposite conception of matter of his predecessors. The majority of the predecessors identified primary matter with the four elements; a small group of predecessors with an indeterminate body. I show how Aristotle's primary matter differs from both views on matter expressed by his predecessors and I try to understand the importance of the concept in Aristotle's natural science. Unlike the blank capacity for everything of prime matter, primary matter is endowed with a determinate capacity, namely the capacity for the four primary contraries. Having a determinate nature, primary matter is instrumental to the explanation of the basic features of natural, sublunary reality, namely its being perceptible and changeable.

4.2.2.3.1. Introduction and *status quaestionis*.

A favourite battlefield for discussion on prime matter is *GC.II.1-5*. And this on good grounds, as the second book of *GC* contains Aristotle's theory of the four elemental bodies. Fire, air, water and earth are the simplest bodies constituting the sublunary world. Answering the question whether Aristotle endorses the existence of prime matter amounts to answering the question whether Aristotle endorses the existence of a substrate of the four elements or not. A reverend tradition stretching through centuries has endorsed that Aristotle does. A more recent, but well-established interpretative line claims that the four elements are the basic, simple constituents of reality.

The traditionalists believe that there is a prime matter that:[95] (a) is the substrate of all things, namely what ultimately underlies their properties, as well as what persists in every process of change they undergo. (b) As its nature is purely potential, and as (a), then primary matter

[95] Digging out the entirety of this tradition and displaying its internal complexity is a task that I will not pursue here. For what I take to be a standard exposition of the traditional interpretative line: Zeller 1879, pp.431ff; Joachim 1922, pp.92-3, 96-7; Robin 1944, 73-80. After King's criticism, the traditional interpretation has been endorsed by: Solmsen 1958, Robinson 1974, Algra 2004, Brunschwig 2004, Scharle 2009.

possesses a capacity for all things. (c) Being purely potential, it is completely indeterminate and does not exist as such in actuality; rather, it exists in all things potentially.

The anti-traditionalist interpretative line is more nuanced than I will be able to depict in these pages.[96] I believe that the most detailed argument for this interpretative line has been provided by Mary Louise Gill, whereas the most lucid reflection of the metaphysical underpinnings of the anti-traditional view can be found in Furth. The following assumptions, as I take it, are characteristic of the anti-traditional interpretation. (d) The four elements are simple, non-composite beings, the ultimate material layer underlying every natural sublunary being. (e) Elemental change can occur in absence of a substrate different from the contraries proper to the elements; for instance, when fire changes into air, a sheer replacement of substances occurs.

I provide here several counterarguments against both of assumptions. How my reconstruction of *GC.II.1-5* differs from the anti-traditionalist view will become evident in the following paragraphs.

With relation to (d), two points can be made. First, the arguments for (d) are subtle, but thin. For instance, Gill (pp.77ff.) denies that the four elements have a hylomorphic structure based on *De Cael.III.3*, where Aristotle distinguishes between simple bodies (the four elements) and composite bodies (the rest of the natural world). The latter ones are composed out of the former ones, which are the simplest bodies of all. Gill evidencetakes this to mean that the four elements cannot be composed out of *anything* else (i.e. that they are not further analysable *tout court*). Rather, Aristotle confines himself to excluding that the four elements are analysable into simpler *bodies*. *GC.II.1*, I argue, endorses that the four elements have a hylomorphic structure, namely that there is a matter underlying the four elements, and that this matter is a body in potentiality. The picture drawn in *GC.II.1* is compatible with the non-analysability claim of *De Cael.III.3*, for this is restricted with relation to bodies. Thus, natural, sublunary complex beings are composed out of the four elements; the four elements are not composed out of simpler bodies, for they are the simplest among bodies. Nonetheless, they are composed out of a common material substrate and primary contraries.

Second, (d) is in contrast with the claim that the four elements are essentially endowed by the four primary contraries. If we refuse to admit that the four elements have a hylomorphic

[96] King 1956; Charlton 1983 and 1992 (1970); Furth 1988; Gill 1989; Broadie 2004; Frede 2004; Rashed 2005.

structure, then we are committed to the reification of the primary contraries. Namely, if fire is hot, and if there is no substrate underlying hotness, then hotness must a thing and not a property. But this is absurd.

Phys.I.6 raises the difficulty whether the principles of natural things are only the contraries or the contraries and the substrate. Namely, whether the substrate may be reduced to contrariety, or whether the substrate is rather a third nature different from the contraries. The difficulty is imported in *Phys.I* by the (partially) dialectical character of its analysis. Plausibly, Aristotle believes that his predecessors failed to grasp the difference between substrate and property, making their material principles reified contraries (fire=the hot; water=the moist). Part of the endeavour of providing a solution to the difficulty consists in clarifying the relation between the substrate and the contraries (*Phys.I.7*). Similarly, a passage from *GC.II.1* contrasts two opposite views on primary matter endorsed by the predecessors. The first group of thinkers identified primary, unanalysable matter with one or more of the elements. The second group with an indeterminate body. The first group is committed to reifying contrary properties, for the four elements are endowed with contraries, and for their material principle is primary and unanalysable. The second group is committed to the actual existence of a body devoid of contraries. Both views are refuted by Aristotle and replaced by his own view on primary matter underlying the four elements. In making the four elements not further analysable, Gill commits to the philosophical error of the first group of the predecessors.

(e) In GC.II.2-5, Aristotle presents his account of elemental change. The four elements undergo generation out of and corruption into each other, when one or both of the primary contraries defining them changes into its/their contrary/contraries. As in other kinds of generation and corruptions, change occurs according to the hylomorphic scheme in which a matter loses a form and takes up a new one. Gill presents a cunning account of elemental change relying on the contraries alone, one of which undertaking the function of matter (namely, persisting through change), while the other two assume the function of form/privation (where form replaces privation). Gill's reconstruction has the advantage of making good sense of Aristotle's claim that adjacent elements (the ones sharing one contrary, but differing with relation to the second contrary) change into each other faster than contrary elements (the elements differing with

relation to both contraries).[97] Nonetheless, Gill's explanation is at best an analogical one. Claiming that a contrary assumes the role of matter in elemental change amounts to either reifying the contrary or entrusting a property with a role it cannot fulfil. In fact, (one of) the role(s) of the substrate in change is to be that which undergoes change by virtue of being the bearer of the contrary properties that alternate through the process of change. But a contrary property does not qualify as a bearer in a process of change.

In conclusion, with relation to Gill's view, I have argued that she fails to demonstrate that the four elements are not analysable into further components, and that the claim that the four elements are simple, unanalysable bodies meets difficulties.

Against the traditionalists, I believe that *GC.II.1-5* cannot be used along with other texts to ground (a,b). *Metaph.VII.3*, according some interpretations, might provide evidence for prime matter as the ultimate substrate underlying *all* things. The scope of *GC.II.1-5* is, instead, the analysis of the material components of the natural, sublunary world. As matter is a principle, and principles are relative terms, matter must be specified with relation to the beings of which it is matter. Different realms of reality do not necessarily have the same matter, for example, among natural things, the sublunary world is composed out of the four elements, whereas the heavens are composed out of ether. The question whether there is a prime matter underlying all things is not pursued in *GC.II.1-5*. In the best-case scenario, the evidence for prime matter that traditionalists may receive from *GC.II.1-5* is evidence for the existence of a material substrate underlying the natural sublunary world.

With relation to (c), widespread suspicion has marred the credibility of prime matter, to such an extent that "it has become fashionable to deny Aristotle's commitment to primary matter" and that "the few traditionalists still around […] consider the view to be something of an

[97] On Gill's account (pp.68-75): (a) when fire (hot, dry) is generated out of air (moist and hot), hot assumes the role of matter, while moist changes into dry in t^1; (b) when fire (hot, dry) is generated out of water (cold, moist), what follows occurs: in t^1, cold assumes the role of matter, while moist changes into dry; in t^2, dry assumes the role of matter, while cold changes into hot. Thus, with relation to the speed of change: (a) < (b). Gill's reading may seem to explain Aristotle's remark on the speed of elemental change more satisfactorily than the traditional view, according to which, when fire is generated out of water, prime matter loses the qualities cold and moist, and acquires the qualities hot and dry. Gill objects that nothing prevents cold and moist to change simultaneously into their contraries in t^1, so that the difference in speed between (a) and (b) would remain unexplained. For the sake of brevity, I do not analyse the topic. I believe, nonetheless, that this apparent advantage of Gill's reading does not compensate for its shortcomings.

embarrassment".[98] The utility and consistency of a pure capacity for everything devoid of any determinacy has increasingly become suspicious. This has led several modern scholars endorsing prime matter to concede primary matter a certain degree of determinacy.[99]

Along with the traditional view, I believe that *GC.II.1-5* supports the claim that the four elements do not constitute the ultimate material layer of reality, for the four elements are hylomorphic compounds. As such, the four elements are composed out of four primary contraries and a substrate, which is indeterminate and potential. Nonetheless, I believe that these claims must be specified. The matter of the four elements is indeterminate with relation to actuality, for it is in itself a potential nature, i.e. as it is what the four elements are *potentially*. With relation to potentiality, nonetheless, the matter of the elements is a determinate capacity. Far from being a blank capacity for everything, the matter of the elements is the capacity for the primary principles of the natural, sublunary things, namely for the primary contrary pairs of hot and cold, dry and moist. These four contraries are the basic principles of natural sublunary beings, for they explain the two essential features of this realm of beings, namely being tangible and changeable. As they are contraries, and as change occurs between contraries, hot, cold, dry and moist account for changeability. As contrariety is what makes things perceptible, and as hot, cold, dry and moist are primary among the tangible contraries, they are the first principles of tangibility. Being a determinate capacity for a determinate set of properties essential to a determinate realm of beings, the matter of the four elements is the ultimate substrate of the natural sublunary world. Thus, although indeterminate with relation to actuality, the matter of the four elements still qualifies as a determinate, explanatory tool with philosophical importance.

In what follows, I analyse selected passages of *GC.II.1-5* in order to reconstruct Aristotle's invention of the concept the relevant matter of the four elements and, thus, of the natural sublunary world. In order to delimitate this concept from the traditional concept of prime matter, I speak of primary matter, meaning with it the primary matter of the natural sublunary world.[100]

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[98] Scharle 2009, p.341.

[99] Sokolowski (1970, pp.263-88), Cohen (1984, p.179; 1996, p.62) and Sorabji (1988) believe that primary matter is spatially extended. Cohen adds the capacity to change, followed by Byrne (2001), who adds the feature of being corporeal.

[100] This paper is confined to the assessment of the significance of *GC.II.1-5* for the discussion on prime matter, and provides partially negative news for the traditionalists. Nonetheless, I remain uncommitted on whether Aristotle endorsed a primary substrate for all beings in other texts. A study of this issue must first answer the general question "what kinds of beings have matter?"; then proceed to the analysis of the primary matter of each kind of being;

Summing up, the results of my analysis of *GC.II* are both negative and positive. On the negative side, I contest that *GC.II* supports the anti-traditionalist view that the four elements constitute the ultimate layer of reality. Regarding the traditional view, I refute that *GC.II* may be used as a witness for prime matter, both from an extensional point of view (for it does not concern the matter of *all* things) and from an intentional point of view (for primary matter is not indeterminate *tout court*, but only with relation to actuality). On the positive side, I claim that *GC.II.1-5* endorses and develops the concept of primary matter as the ultimate material element of natural, sublunary reality. The core of this project consists in clarifying the relation between primary contrariety and its substrate, primary matter.

4.2.2.3.2. The agenda of *GC.II.1-5*. The four elements and primary contrariety.

In *GC*, II.1, 328b26-329a8, Aristotle sets the topic of the second book, namely the four elements. The analysis of the four elements connect to the general topic of *GC*, namely to the analysis of change in general and of substantial change in particular, for the four elements are the material principles responsible for the generation and corruption of the natural world. A possible reconstruction of the argument for this claim is the following.

> [P1] "generation and corruption in the case of all substances which are by nature composite do not occur without the perceptible bodies".[101]
>
> [P2] (*endoxon*): Most of the predecessors claim that the four elements (one, two, three or all four of these) are the substrate and matter of the perceptible bodies (i.e. of natural things).
>
> [P3] And natural things undergo generation and corruption by virtue of their matter(s).[102]

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finally, ask whether Aristotle endorses a further substrate of the primary matters. My sympathy goes to the idea of a set of primary matters, each coinciding with the determinate capacity for the primary formal principles proper to each realm of the enmattered being. Several texts (among which *Metaph.VII.3*) may provide evidence that Aristotle engages in the mental experiment of stripping something down to its last feature and property in order to reach pure subjecthood. That the result of this mental experiment corresponds to a being and not to utter nothingness has been (I believe rightly) contested.

[101] *GC*, II.1, 328b32-3. For the Greek text of *GC*, I use the most recent critical edition of the work: Rashed 2005. Occasional diversion from Rashed's text are signalled.

[102] [P2,3] cf. *GC*, II.1, 328b33-329a5.

[C] Therefore, the four elements are elements or principles of generation and corruption.[103]

[P2] is stated as an *endoxon*, and is apparently one that Aristotle does not intend to challenge. And this on two grounds. Firstly, Aristotle devotes the large section of *GC.II.1* (329a8-b3) to the refutation of the heterodox view that matter is an indefinite body different from the four elements. Secondly, in *GC*, II.1, 329b3-6, Aristotle sets the agenda of *GC.II.2-5* on the assumption that P2 is true.

GC, II.1, 329b3-6

Ἀλλ' οὐδὲν ἧττον καὶ ὡς σώματος ποίας καὶ πόσας λεκτέον ἀρχάς· οἱ μὲν γὰρ ἄλλοι ὑποθέμενοι χρῶνται, καὶ οὐδὲν λέγουσι διὰ τί αὗται ἢ τοσαῦται.

And nonetheless, we must discuss also which ones and how many [of the elements] are principles of the body. In fact, the other [thinkers], make use [of the elements] [merely] by virtue of assuming them, but they say nothing about why [they make use of] these particular elements or [of] these many.

As in *Phys.I.5*, Aristotle's use of dialectical premises in 329b3-6 follows two steps. The first step consists in accepting the dialectical premise as valid, namely, that there are four elements. The second step consists in providing the rationale for the truthfulness of the dialectical premise. The project of providing a rationale for the fact that the material principles of natural (sublunary) bodies are the four elements fire, air, water and earth, and only these four elements, is fulfilled in *GC.II.2-3*.

In *GC.II.2*, Aristotle selects the primary contraries that qualify as principles of the natural world. This selection is achieved in two steps. Firstly, as the natural things are the things which are tangible, the contraries qualifying as principles of natural things are the contraries belonging to touch (329b7-16). Secondly, the contraries qualifying as principles of natural things are, among the contraries belonging to touch, those that are primary. Thus, Aristotle enlists the contraries belonging to touch and shows that all of them can be reduced to two pairs of contraries, which, in turn, are not reducible to each other: hot/cold and dry/moist (329b16-330a30).

In *GC.II.3*, Aristotle answers the question on the number of the material elements on the basis of the results of the previous chapter. He argues that, as the primary contraries are four, and as the possible combinations of these four contraries are also four (for hot does not combine with cold,

[103] *GC*, II.1, 329a5-8.

nor dry with moist, in virtue of the principle of non-contradiction), then also the primary elements of the natural world are necessarily four. Specifically, each of the four elements posited by the predecessors is identified by one contrary in a robust sense (first position) and by another contrary in a weaker sense (second position):

fire: hot and dry

water: cold and moist

air: moist and hot

earth: dry and cold

Note that the four primary contraries qualify the four elements essentially. Unlike the case of my body becoming ill and undergoing a change in temperature, fire is in itself hot, and water is in itself cold. Therefore, the contraries constituting fire are contrary to those constituting water, so that fire and water can be viewed as contraries. The same is true of air and earth.

GC, II.3, 331a1-3

Καὶ ἑκάτερα ἑκατέροις ἐναντία· πυρὶ μὲν γὰρ ἐναντίον ὕδωρ, ἀέρι δὲ γῆ· ταῦτα γὰρ ἐκ τῶν ἐναντίων παθημάτων συνέστηκεν.

Two of them are contrary to the other two, respectively: water is contrary to fire and earth to air, for they are constituted by contrary affections.

Summing up, in *GC.II.2-3* Aristotle endorses the claim that the four material elements are composed out of contrary affections. In virtue of this, Aristotle claims, the four elements are subdivided into the two contrary pairs of fire/water and air/earth. The contrariety reigning among the four elements is the rationale for the capability of the four elements to change into each other, thus causing generation and corruption in the natural world (*GC.II.4-5*). According to the picture drawn so far, the anti-traditionalist view identifying the ultimate material layer of natural, sublunary reality with the four elements may seem to hold.

In what follows, I rather show that Aristotle believes that the four elements, despite being the primary components of the natural world, are nonetheless not simple, unanalysable beings. Rather, the four elements are further analysable into a potential substrate and the four primary contrarieties (hot/cold; dry/moist). I claim that Aristotle endorses that there is a substrate that is common to all four elements, but whose nature does not coincide with that of the four elements

and with the contrariety affecting them. As the substrate of the four elements *is only potentially* the primary contraries that constitute the elements, this substrate, considered in itself (as potentiality), is not a contrary.

The invention of primary matter is achieved, in *GC.II.1*, through the confrontation with the predecessors. With the label "primary matter", I refer to the ultimate material substrate of reality, without committing myself to whether it be the indeterminate prime matter endorsed by the traditional interpretation of Aristotelian matter. Aristotle begins his discussion of the doctrines on primary matter of his predecessors by confronting two groups of thinkers.

On the one hand, the group of the thinkers who posited one or more of the four elements as primary matter.[104] The view that the four elements are the primary *bodies* constituting the natural world is one that Aristotle is willing to endorses.[105]

The prevailing view held by the predecessors that primary matter must be identified with the four elements and their contrariety is contrasted in *GC*, II.1, 329a8-b3 with the view of those philosophers, such as Anaximander and Plato, who identify primary matter with an indeterminate nature that is different and separate from the four elements and their contrariety. As the theories of Anaximander and Plato are criticised, this section has been broadly interpreted as a piece of evidence for Aristotle's rejection of the existence of an indeterminate prime matter.

I claim, instead, that this section contains only the criticism of a particular model of indeterminate primary matter. Far from rejecting the concept of primary matter altogether, Aristotle's criticism highlights the inconsistencies affecting his Anaximander's and Plato's primary matter. In the following lines (329a24-b3), where he states his own position about primary matter, Aristotle clearly endorses the existence of a primary matter underlying the four elements. As the primary substrate of reality underlying the primary contraries, primary matter is different, although not separate, from contrariety.

In conclusion, Aristotle on the one hand endorses the *endoxon* [P2] that the four elements are the primary *bodies* out of which the sublunary natural world is composed. On the other hand, he

[104] *GC*, II.1, 328b33-329a5.
[105] *GC*, II.1, 329a5-8. Note the words ἔστω συνομονολογούμενον.

argues that the four elemental bodies are in turn hylomorphic compounds, and thus analysable into primary matter and the four primary contraries.

4.2.2.3.3. Aristotle's criticism of the indeterminate primary matter of the predecessors.

The criticism of the second group of thinkers endorsing an indeterminate primary matter beyond the four elements can be divided into two sections.

In 329a8-13, Aristotle refutes the view of a group of philosophers,[106] according to which there is a matter that is on the one hand corporeal and perceptible, and on the other hand separate from the elements. This refutation has, at least in part, the role of defending the *endoxon* [P2].

In 329a13-24, Aristotle criticises Plato's theory of the Receptacle from the *Timaeus*. Aristotle first laments Plato's unclarity of expression. Then, he cautiously charges the Receptacle with the same inconsistency affecting the indeterminate matter endorsed by the previous group of thinkers.

The first group of philosophers (329a8-13) are not explicitly mentioned. It is most plausible that Anaximander belongs to this number. Likewise, it is plausible that the philosopher(s) endorsing an intermediate body between two of the four elements is/are also meant. A proximate reference to this/these philosopher(s) is contained in 328b35-329a1, where he/they are mentioned along with the philosophers who posited one of the four elements as the basic material constituent of reality. Although they belong to the first group of thinkers, namely to those who oppose Anaximander and Plato, the intermediate nature is described as a σώμα τε ὂν καὶ χωριστόν. Like the other monists, the philosopher(s) endorsing the intermediate assumed that the principle is a certain bodily nature. Unlike the other monists (who endorsed one of the four elements), the philosopher(s) endorsing the intermediate made the principle separate from the four elements. Thus, even if the philosopher(s) endorsing the intermediate is/are enlisted along with philosophers identifying matter with (one of) the four elements, they/she assume(s) that the intermediate is separate from the elements, and nonetheless a body. From Aristotle's perspective, this position is implausible, as the arguments in 329a8-13 shows.

[106] Most probably Anaximander. Also, Rashed 2005, *ad loc*.

Aristotle's interpretation of the intermediate is nonetheless not free from ambiguity. In several passages, the intermediate is endowed with an intermediate degree of density and rarity between two of the four elements, and is thus assimilated to the determinacy and possession of contrariety proper to the elements.[107] In this connection, the philosopher(s) endorsing the intermediate can be assimilated to the prevailing view that primary matter coincides with the four elements. Other passages, instead, attest the separateness of the intermediate from the four elements and their contrariety.[108] Several among of these passages assimilate the intermediate to Anaximander's *apeiron*, as both the *apeiron* and the intermediate are separate from the elements and lack qualitative determinacy.

It is possible that the ambiguity of Aristotle's interpretation of the intermediate is not due to Aristotle's lack of consistency. Rather, it may reflect the inconsistency with which the theory of the intermediate is charged in our passage, if the intermediate is both endowed with the contrariety proper to the four elements (being a mixture of two elements) and posited as separate from the elements.[109]

For the sake of brevity, as scholars accept unanimously that 329a8-13 tackle Anaximander's *apeiron*, I refer to the kind of primary matter discussed in these lines as *apeiron*.

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[107] *Phys.*, I.4, 187a14ff.; *De Cael.*, III.5, 303b12ff.; *Metaph.*, I.8, 989a12ff.

[108] A list of relevant parallels to our topic, namely the relation between matter (i.e. the intermediate) and contrariety, is the following one. In *Metaph*, I.7, 988a23-32, the intermediate is mentioned as a material principle. Bodiliness or lack thereof shape the survey of material principles of the predecessors, along with the number of material principle(s) assumed. It is not clear from this passage, though, whether Aristotle believe the intermediate to be bodily or not. In *Phys.*, I.6, 189b1-8, as we have seen, Aristotle mentions the intermediate as a close approximation to his own concept of indeterminate primary matter, as the intermediate fulfils the alterity requirement for matter more than the other principles of the predecessors. Apparently, the rationale for this claim is that the intermediate is not intertwined with contrariety, whereas the elements are (189b4-5: μετ' ἐναντιοτήτων συμπεπλεγμένα).

[109] It is plausible that the philosopher(s) positing the intermediate as a principle also endorsed its separateness from the four elements. As I said, the doctrine of the intermediate is always mentioned anonymously in Aristotle's *Corpus*. Moreover, Aristotle refers to two different kinds of intermediate substance, namely one that is between fire and air and one that is between air and water (for a complete collection of passages, see Kahn 1960, p.36-7). Against this background, it is difficult to assess whether the thinker(s) endorsing the intermediate committed himself/themselves to its separateness from the elements. Aristotle seems to believe that he/they both did and did not, thus contradicting himself/themselves. Simplicius and Philoponus, both making use of Theophrastus' *Physikon Doxai*, attribute in several passages the paternity of the doctrine of the intermediate to Anaximander, on the basis of the fact that both the *apeiron* and the intermediate are separate from the elements, thus conflating Aristotle's presentation of the theories as two different ones. Whether Anaximander's *apeiron* should be identified with the intermediate or not has been and is object of controversy. According to me, the most complete collection of material and the most useful discussion of the topic can be found in Schleiermacher (1811) and Zeller-Mondolfo (1950), who refute the identification of intermediate and *apeiron* (*pace* a more recent and authoritative defence of the identification in Barnes (1982)). What is important with relation to the present discussion, though, is that both Simplicius and Philoponus lend some support to the claim1 that also Theophrastus interpreted the intermediate as separate from the four elements.

GC, II.1, 329a8-13

> Ἀλλ' οἱ μὲν [a] ποιοῦντες μίαν ὕλην παρὰ τὰ εἰρημένα, ταύτην δὲ [b] σωματικὴν καὶ [c] χωριστήν, ἁμαρτάνουσιν· [d] ἀδύνατον γὰρ ἄνευ ἐναντιώσεως εἶναι τὸ σῶμα τοῦτο αἰσθητῆς·[110] [e] ἢ γὰρ κοῦφον ἢ βαρὺ ἢ ψυχρὸν ἢ θερμὸν ἀνάγκη εἶναι τὸ ἄπειρον τοῦτο, ὃ λέγουσί τινες εἶναι τὴν ἀρχήν.
>
> But those [thinkers] who posit one single matter beyond those mentioned [i.e. beyond the four elements], making it both bodily and separate, are mistaken. For it is not possible for this body to exist without perceptible contrariety. In fact, the indefinite [nature] that some [thinkers] posit as a principle must be either light or heavy, either cold or hot.

Aristotle's criticism in *GC*, II.1, 329a8-13 takes up the inconsistency between two features of the *apeiron*: on the one hand, [b] being a natural body; on the other hand, [a] being beyond and [c] separate from the four perceptible elements and [d] from the contraries they are intertwined with. These two features attributed to the *apeiron* are, according to Aristotle, incompossible. In fact, it is impossible for the primary material principle to be both a body and [e] devoid of any positive, contrary feature.

In his criticism of the existence of the *apeiron*, Aristotle endorses the view that an indeterminate body separate from contrary perceptible features cannot exist, for [d] all natural bodies are endowed with contraries. Two attributes of the *apeiron* ([b,c]) are in antinomy:

[b] bodiliness;

[c] separateness from:

[c^1] the contraries;

[c^2] perceptibility (i.e. the power of contraries to be principles of perception).

The argument seems to assume a certain degree of reciprocal entailment between the notions of natural body, perceptibility and contrariety. A natural body is something that is necessarily endowed with perceptible qualities, and perceptible qualities coincide with the contraries. In fact, there seems to be for Aristotle a certain degree of interchangeability between being a natural body and being something perceptible. The common ground underlying perceptibility and

[110] With Joachim 1922 and Williams 1982, I accept the *lectio difficilior* (attested by the manuscripts H, J^1 and V) αἰσθητῆς, referring back to ἄνευ ἐναντιώσεως. The most recent critical text of *GC*, Rashed 2005, reads instead the accusative αἰσθητόν, so that the sense which of the sentence would be: "for it is not possible for this perceptible body to exist without contrariety". Rashed's reading is both attested by the majority of the manuscripts and syntactically plainer. Nonetheless, being the *lectio facilior*, it is more likely to be an interpolation than the other one. Moreover, the development of the argument seems to support Joachim's reading rather than Rashed's.

bodiliness may be found in the contraries themselves. In *de An.II.5-12*, contrariety is made responsible for the capacity of the object to affect the perceptive capacity of the soul.[111] Thus, [c^2] can be seen as a subcase or consequence of [c^1].

A similar criticism is contained in *Phys.*, III.5, 204b22-35, where Aristotle refutes the existence of an indeterminate body beyond and separate from the four elements. This passage is close in terminology with the previous one, and is commonly believed to tackle Anaximander's *apeiron*. Aristotle first (lines 24-9) provides an argument for positing as principle an indeterminate, perceptible body existing beyond the elements, and then (lines 29-35) refutes the existence of such an indeterminate principle.

The argument for positing such an indeterminate principle derives from the observation of the destructive power of one feature over its contrary. If one of the four elements were infinite, say fire (i.e. a hot and dry substance), then the power of hot and dry would also be infinite, thus undermining their contraries, cold and moist. The consequence would thus be material monism, as reality would consist exclusively of fire. In order to avoid rule out this consequence, the infinite must be something indeterminate, beyond and separate from the four elements and their contrariety.

Aristotle's criticism to Anaximander's *apeiron* in *Phys.*, III.5, 204b29-35 addresses the inconsistency arising from positing a natural body that is both perceptible and beyond the four elements (and their contrariety). It is not to be assessed whether Anaximander was committed to the claim that his *apeiron* is perceptible. Nonetheless, Aristotle apparently believes he should be, and paraphrases Anaximander's own words in order to nail him to this assumption. A plausible reconstruction of the argument is the following: if all things are dissolved into that out of which they have come into being; and if the elements come into being from the *apeiron* and dissolve

[111] One passage for all: *de An.*, II.11, 422b23-27: πᾶσα τε γὰρ αἴσθησις μιᾶς ἐναντιώσεως εἶναι δοκεῖ, οἷον ὄψις λευκοῦ καὶ μέλανος, καὶ ἀκοὴ ὀξέος καὶ βαρέος, καὶ γεῦσις πικροῦ καὶ γλυκέος· ἐν δὲ τῷ ἁπτῷ πολλαὶ ἔνεισιν ἐναντιώσεις, θερμὸν ψυχρόν, ξηρὸν ὑγρόν, σκληρὸν μαλακόν, καὶ τῶν ἄλλων ὅσα τοιαῦτα. […] καὶ ἐπὶ τῶν ἄλλων αἰσθήσεών εἰσιν ἐναντιώσεις πλείους, οἷον ἐν φωνῇ οὐ μόνον ὀξύτης καὶ βαρύτης, ἀλλὰ καὶ μέγεθος καὶ μικρότης, καὶ λειότης καὶ τραχύτης φωνῆς, καὶ τοιαῦθ' ἕτερα. εἰσὶ δὲ καὶ περὶ χρῶμα διαφοραὶ τοιαῦται ἕτεραι. [Critical text: Jannone/Barbotin 1966] "For every sense seems to be concerned with one pair of contraries, e.g. sight with white and black, hearing with high and low pitch, and taste with bitter and sweet; but in the object of touch there are many pairs of contraries: hot and cold, dry and wet, rough and smooth and so on for the rest. […] there are many other contraries in the case of the other senses, also, e.g. in vocal sound there is not only high and low pitch, but also loudness and softness, and smoothness and roughness of the voice, and so on. There are other differences of this kind in the case of colour, too". [Transl.: Hamlyn 1993, slightly modified].

into it; then the *apeiron* must exist in the natural world beside the four elements, and at the same time be separate from them, being an indeterminate nature. But such an indeterminate nature is not perceived beside the elements. Although Aristotle's argument is not the most perspicuous one, it is clear that the strategy is to confront Anaximander's *apeiron* with the perceptual counterfactual. Being the source of generation and corruption of the primary perceptual bodies (namely of the elements), the *apeiron* must be placed in the natural world of which we have experience (line 204b34: ἐνταῦθα), along with the four elements. Our common experience of the natural world, nonetheless, provides no indication of the existence of an indeterminate simple body such as the *apeiron*.

The refutation of the intermediate as an indeterminate body in *GC* and that of Anaximander's *apeiron* in *Phys.III.5* present a certain degree of terminological and conceptual ambiguity. The expressions παρὰ τὰ στοιχεῖα and χωριστός recurring in both passages in order to address the alterity between the principles and the four elements can have both a weak and a robust meaning. Respectively, they can mean both "beside the elements" and "different" from them, and "beyond the elements" and "separate" from them. The former and weaker meaning is not committed to existential import, whereas the latter and stronger meaning rather entails that the *apeiron* exists independently of the elements, but not the other way round.

As the *apeiron* and the intermediate are principles, and thus ontologically primary and separate beings, a robust interpretation of the arguments may be privileged. Aristotle would thus pinpoint the inconsistency of positing as principle an indeterminate body separate from the elements, the fact notwithstanding that anything qualifying as a body must be endowed with contraries and be perceptible.

In his own assessment of the relation between primary matter and the four elements/primary contraries (*GC*, II.1, 329a24-b3), Aristotle takes up the same language used in his refutation of the intermediate, and clarifies in which sense primary matter is different/separate and beside/beyond the four elements and their contrariety. If *Phys.III.5*, purporting to clarify the nature of the infinite, confines itself to rule out the existence of an indeterminate body beyond the elements (along with *GC*, II.1, 329a a8-13), *GC*, II.1, 329a24-b3 accepts the positive import of Anaximander's argument for not reducing the material principle to the four elements. This

partial acceptance of Anaximander's argument results in a revised version of Anaximander's material principle, namely in the invention of primary matter.

The rationale for the appeal of a revised version of Anaximander's material principle is not stated. Some light on the issue may be shed by a premise from the argument in *Phys.*, III.5, 204b24-9, namely by the claim that the four elements are, due to their contrariety, reciprocally destructive. Aristotle may have concerns about the ontology of change, as some interpreters believe, and posit a persistent primary substrate of the elements in order to avoid sheer replacement in elemental generation and corruption. The idea that the material substrate persists through generation has been, nonetheless, strongly criticised in the last decades.

Aristotle's concern may be a different one, namely to get the relation between contrariety and the elements right. Not positing a primary matter for the four elements, and accepting that the elements are endowed with contraries, is a conceptual stance that is unlikely to escape the charge of reifying properties. Thus, Aristotle's rationale for positing primary matter may regard being rather than change.

The following section of our text (*GC*, II.1, 329a13-24) deals with Plato's doctrine of the Receptacle in the *Timaeus*. Aristotle's criticism addresses details of Plato's doctrine that are of little interest for the present discussion. Two pieces of evidence can be nonetheless drawn from Aristotle's account.

Firstly, Plato (should have) endorsed the claim that primary matter is separate from the elements and from contrariety, for he posits his Receptacle as the primary substrate of the four elements. Being prior to the creation of the four elements, it is also existentially separate from them.

Secondly, Plato is not consistent with his own claim, for he seems to assume that his Receptacle is something determinate, by virtue of comparing it to the gold underlying golden objects (and of conflating qualitative and substantial change from matter). Aristotle's criticism refers most probably to *Tim.*, 48e-50c. In this passage, Plato introduces the Receptacle. Quite surprisingly, he contrasts the cycle of elemental change, characterised by instability, to the stability of the primary substrate. It is this latter, he argues, that should be labelled "this and that" (τόδε καὶ τοῦτο), whereas the ever-changing elements should be labelled as "in this wise" or "having this

quality" (τοιοῦτο).[112] Likewise, with relation to golden artefacts, the matter gold qualifies as "this", whereas the forms into which it can be moulded are only wises and qualities of the stable matter.

Aristotle's criticism may seem to take Plato's parallelism between the Receptacle and gold too literally, attributing to Plato the idea that the Receptacle is something determinate as gold is, and therefore a "this" in the Aristotelian sense (i.e. as "something determinate") and not in the Platonic sense (i.e. as a synonym of "something stable").

I believe, instead, that Aristotle's criticism hits the target. In 50a5-b5, Plato introduces the example of the gold and the golden artefacts that Aristotle addresses in *GC.II.1*. In 50b5-c6, what has been said with relation to gold is extended to the Receptacle. Now, there is some evidence that Plato should be committed to the view that the Receptacle is a formally determinate nature just as gold is, for he is committed to the idea that matter provides the most reliable answer to the question on the essence of something. Plausibly, Plato's argument hinges on the requirement for stability that the essence of something must possess. If the form of the artefacts is changeable and the matter of the artefacts (i.e. gold) remains stable through the process of moulding, then the essence of something must coincide with its matter rather than with its form. The same holds for the case of the Receptacle. As the four elements are the ever-changing appearance determining the Receptacle, which in turn remains what it is through the process of elemental change, it follows that the Receptacle is the essence of the elements.

Once this has been endorsed, Plato's assumption is evidently confronted with two absurdities: either the essence of reality is something indeterminate and uninformative or the Receptacle is both indeterminate and determinate.

In conclusion, I have claimed that, in *GC*, II.1, 329a8-24, Aristotle criticises several models of indeterminate primary matter (Anaximader's *apeiron*, Plato's Receptacle; possibly the intermediate). These models are opposed to the doctrines of the thinkers endorsing determinate primary matter (i.e. the four elements). I have claimed that Aristotle does not undertake his critical agenda with the intention of ruling out the possibility of the indeterminate primary matter *tout court*. Rather, Aristotle wants to criticise the inconsistencies affecting his predecessors'

[112] *Tim.*, 49b-50a4.

models of primary matter in order to develop his own concept of primary matter. The core of this project lies on the clarification of the way in which the primary matter of the four elements is separate (χωριστός) from the contraries identifying the four elements. Clarifying this amounts to assessing also the claim to bodiliness and perceptibility of primary matter. My next paragraph is devoted to the analysis of this project.

4.2.2.3.4. Aristotle's primary matter.

In what follows, I show that Aristotle endorses himself the existence of a primary matter. In introducing his own concept of an indeterminate primary matter, Aristotle solves the difficulties affecting the doctrines of his predecessors. As a reminder, these difficulties rest on the antinomy between two features attributed to primary matter by the predecessors:

[b] bodiliness;

[c] separateness from:

[c^1] the contraries;

[c^2] perceptibility (i.e. the power of contraries to be principles of perception).

Instrumental to this project are two conceptual endeavours: firstly, the clarification of the way in which primary matter is χωριστός from contrariety (and therefore from perceptibility); secondly, the introduction of the concept of potentiality. The second point clarifies the first one.

In a nutshell, Aristotle's primary matter is not a body (actually) existing in separation from (i.e. independently from) contrariety. Rather, the nature of primary matter is to be potential. The potentiality of matter does not coincide with complete indeterminacy, but rather with a determinate capacity, namely the capacity for the four primary contraries defining the four elements. Thus, primary matter is the determinate capacity for the four elements, and is perceptible in potentiality, but not in actuality. As the determinate capacity to the primary contraries and to the four elements, primary matter does not exist in actuality as an indeterminate body. Rather, primary matter exists only dependently on the actual existence of the four elements (and of the bodies constituted out of them), as substrate of the primary opposition (directly) shaping the four elemental bodies (and, derivatively, the complex bodies constituted out of the

four elements). Therefore, primary matter does not exist independently of the contraries and the four elements.

Nevertheless, taken in abstraction from the elemental bodies, i.e. considered as the substrate of the primary contrariety, primary matter is different from the contraries, for it is the capacity for the primary contraries, but does not coincide with the contraries in actuality. Thus, primary matter, considered in itself, is not a contrary, for its nature is to be potential.

In conclusion, as primary matter is the determinate capacity for the four primary contraries, primary matter is χωριστός from contrariety in the following sense. With relation to actuality, primary matter is different from contrariety, for it is in itself potential. With relation to potentiality, as primary matter is a determinate capacity for the primary contraries, primary matter is not (existentially) separate from contrariety.

In what follows, I analyse Aristotle's discussion of his own concept of primary matter in *GC*, II.1, 329a24-b3.

> *GC*, II.1, 329a24-b3
>
> [f] Ἡμεῖς δὲ φαμὲν μὲν εἶναί τινα ὕλην τῶν σωμάτων τῶν αἰσθητῶν, [g] ἀλλὰ ταύτην οὐ χωριστὴν ἀλλ' ἀεὶ μετ' ἐναντιώσεως, [h] ἐξ ἧς γίνεται τὰ καλούμενα στοιχεῖα. Διώρισται δὲ περὶ αὐτῶν ἐν ἑτέροις ἀκριβέστερον. Οὐ μὴν ἀλλ' ἐπειδὴ καὶ τὸν τρόπον τοῦτόν ἐστιν ἐκ τῆς ὕλης τὰ σώματα τὰ πρῶτα, διοριστέον καὶ περὶ τούτων, [i] ἀρχὴν μὲν καὶ πρώτην οἰομένους εἶναι τὴν ὕλην τὴν ἀχώριστον μέν, [j] ὑποκειμένην δὲ τοῖς ἐναντίοις· [k] οὔτε γὰρ τὸ θερμὸν ὕλη τῷ ψυχρῷ οὔτε τοῦτο τῷ θερμῷ, ἀλλὰ τὸ ὑποκείμενον ἀμφοῖν. [l] Ὥστε πρῶτον μὲν τὸ δυνάμει σῶμα αἰσθητὸν ἀρχή, [m] δεύτερον δ' αἱ ἐναντιώσεις, λέγω δ' οἷον θερμότης καὶ ψυχρότης, [n] τρίτως δ' ἤδη πῦρ καὶ ὕδωρ καὶ τὰ τοιαῦτα· [o] ταῦτα μὲν γὰρ μεταβάλλει εἰς ἄλληλα [...] αἱ δ' ἐναντιώσεις οὐ μεταβάλλουσιν.
>
> [f] But we claim that there is a certain matter of the perceptible bodies, [g] but that this is not separate, but rather always intertwined with contrariety; [h] and out of this the so-called [four] elements are generated. These topics have been tackled with more precision in other writings. Nonetheless, as it is in this manner that the primary bodies come to be out of matter, it must be also enquired into these, [i] claiming that what is a principle and primary is the matter that is, on the one hand, non-separate and, on the other hand, [j] the substrate of the contraries. [k] For, neither is the hot the matter of the cold nor the other way round; rather, the substrate [of them] is the matter of both. [l] In conclusion: first, that which is potentially a perceptible body is a principle; [m] second, the contraries, e.g. hotness and coldness; [n] third, also fire, water and the others such as these, [o] for they change into each other, whereas the contrarieties do not change [into each other].

The topic of the passage is the primary matter of the four elements, namely the matter [h] out of which the four elements have come into being and the matter underlying [f] perceptible reality and [j] the contrarieties constituting it.

Aristotle's doctrine of primary matter is introduced in [g] by a criticism of one of the two opposing features of the primary matter endorsed by the predecessors, namely by a criticism of its [c] separateness from the four elements and their contrariety. Aristotle's primary matter is, against his predecessors', "not separate, but rather always intertwined with contrariety". If we consider [g] alone, Aristotle may seem to reject altogether the predecessors' claim that there is a primary, (actually) indeterminate matter. If we stopped at this stage of Aristotle's argument, we could go along with the scholars who claim that the four elements are the most primary matter that Aristotle is willing to endorse. This impression reveals itself to be misleading, once we analyse the rest of the argument.

In [g], Aristotle claims generally that (primary) matter is intertwined with contrariety and (thus) "not separate" (cf. also [i]). The general claim of [g] on the relation between matter and contrariety is clarified in [j,k], and finally in [l].

Aristotle contrasts in [i-k] two ways in which primary matter is χωριστός from contrariety. [i] states that primary matter is existentially non-separate from contrariety. In [k], which provides the rationale for the claim of primary matter to be the substrate underlying primary contrariety in the four elements, primary matter is said to be different from the contraries.

Let us analyse [j,k]. [k] provides the rationale for the claim that primary matter, as the substrate of the primary contraries, cannot be itself a contrary. Rather, what is the matter of the contraries must be something different from the contraries and must be common to them. For example, let us take what is cold and what is hot; neither what is cold can be the substrate of what is hot, nor the other way round. Rather, the substrate of what is cold and the substrate of what is hot must be common to both hot and cold, and must be different from each of them. Aristotle does not explain why this is necessary, but a most plausible interpretation of this argument is gained by invoking the principle of non-contradiction and the incompossibility of the contraries. If H^+ and H^- are contraries, then H^+ and H^- are incompossible. Thus, if H^- were the substrate of H^+, then H^- would be at the same time H^+, which is impossible. Therefore, H^- is not the substrate of H^+. The

hypothesis that H^+ is the matter of H^- is necessarily false for the same reason. Thus, primary matter, as it is the substrate of the primary contraries, is different from the primary contraries.

An opponent of this results may reply that matter could nevertheless be a contrary, provided that it is a different contrary from the contraries of which it is matter. For example, the matter of what is hot and of what is cold may be what is smooth. Against this possible observation, Aristotle uses in his argument the primary contrariety of hot and cold. Clearly, it would be nonsense to assume that the primary contrariety of hot and cold may have a posterior contrariety as matter (e.g. smooth), for smooth would be both prior and posterior to hot and cold, if matter is (at least in a certain sense) prior to that of which it is matter. Assuming that the matter of hot and cold may be a member of the other pair of primary contraries (dry or moist) will also lead to nonsense, for hot and cold would fail to qualify as primary contraries along with dry and moist. In conclusion, what is the matter of H^+ and H^- is not itself a contrary and is common to both H^+ and H^-.

Let us come back to the way in which primary matter is χωριστός from contrariety. The particles μέν/δέ introducing, respectively, [i] and [j,k], indicate a contrast between two ways in which primary matter is χωριστός from contrariety. In a nutshell, as substrate of the contraries in the four elements, primary matter is both non-separate from the contraries and distinct from the contraries.

This having been assessed, there seems to be at least a mild antinomy between the claim that matter is: [i] not separate from opposition; and [j,k] different from opposition. This antinomy is solved in [l-o], where Aristotle draws the general conclusion of his previous argument (ὥστε), enumerating the principles of the natural sublunary world and of its generation and corruption. The introduction of the concept of potentiality in [l] clarifies in which sense primary matter and primary contrariety are related to each other.

[l] Ὥστε πρῶτον μὲν τὸ δυνάμει σῶμα αἰσθητὸν ἀρχή

[l] In conclusion, firstly, what is potentially a perceptible body is a principle

The solution of the antinomy rests on the claim that matter is bodily and perceptible, i.e. intertwined with contraries, only potentially. With relation to actuality, namely to the four elements of which it is substrate, primary matter is non-separate from the contraries. Rather, it

exists only in conjunction with contrariety and with the basic constituents of the natural sublunary world, the four elements. With relation to potentiality, namely with relation to what primary matter is in itself, primary matter is different from contrariety.

Aristotle's conclusion, thus, modifies the aporetic claims on primary matter of his predecessors. The predecessors' endorsement of [b] bodiliness is qualified into the claim that primary matter is [l] (=[b*]) *potentially* a body. Primary matter does not qualify as an actual body, for it is indeterminate, and no indeterminate body exists in actuality. Nonetheless, as the substrate of the primary natural bodies (the four elements) constituting all sublunary natural bodies, primary matter possesses capacity for bodiliness.

The capacity for bodiliness of primary matter can be understood with respect to its being χωριστός from contrariety. The indeterminate matter of the predecessors, being [b] separate from [c^1] contrariety and [c^2] perceptibility, cannot qualify as a body in actuality, as the predecessors are committed to believe. Aristotelian primary matter is [c^{1*}] different and non-separate from contrariety. It is non-separate, for it is the capacity for the primary contraries, and is thus intertwined with contrariety with relation to potentiality. It is different, for it is in itself merely potential, and thus indeterminate with relation to actuality. As primary matter is what it is only in potentiality, then primary matter is in itself different from contrariety. Thus, as contrariety is the principle of perceptibility, [c^{2*}] primary matter is potentially perceptible.

Thus, primary matter is [b*] different with relation to actuality and non-separate with relation to potentiality and capacity [c^{1*}] from contrariety. As capacity for the four primary contraries, [g] primary matter is not without opposition.

In conclusion, Aristotle's doctrine of primary matter can be summarised as follows. Primary matter is:

[j] the substrate of the contraries;

[c^{1*}] potentially endowed with contraries;

[l,c^{2*}] potentially perceptible;

[l,b*] and thus, as [c^{1*}] and [c^{2*}], potentially a body.

The claim that matter is the potential substrate of the contraries has some bearing on the role of the contraries principles of natural things. In [m], contrarieties (ἐναντιώσεις) such as hotness and coldness (θερμότης καὶ ψυχρότης) are reckoned as the second principle of the natural, perceptible beings along with their substrate, i.e. along with primary matter. As they inhere in primary matter, the contrarieties must be understood as properties; in the present case, as the property of being hot and of being cold. This assessment implies a clarification of the ontological status of the contraries. In [k], in fact, the ontological status of the contraries (ἐναντία) "what is hot" and "what is cold" (τὸ θερμόν and τὸ ψυχρόν) is indeterminate to such an extent that the contraries can be, accepting *ex hypothesis* the thought of the predecessors, considered as substrates. In fact, the terms τὸ θερμόν and τὸ ψυχρόν, being substantive adjectives, indicate no determinate ontological status. "What is hot" and "what is cold" can both refer to properties (being-hot and being-cold) and to the substances that are endowed with the properties of, respectively, being hot and of being cold (e.g. fire and water). As substances endowed with a certain property, "what is hot" and "what is cold" are entitled to qualify as substrates of properties (e.g. what is hot, i.e. fire, is bright). As properties, "what is hot" and "what is cold" are entitled to qualify as substrates with relation to subordinate properties, but not as ultimate substrates, for hotness in turn exists only in a substrate.

The passage from "contraries" (indeterminate ontological status) to "contrarieties" (properties) is picked up in [n,o]. In [n], the third principle of natural, perceptible beings are said to be the four elements. The four elements are principles in the third place not only in a numerical sense, but rather also in a temporal sense: primary matter and the opposition determining it are prior to the four elements, for the four elements are composed out of them.

It is not accidental that the examples provided in [n] for the four elements are fire and water, namely the elements identified by virtue of possessing each by itself, respectively, the property of hotness and coldness mentioned in [m] as a property inhering in primary matter and in [k] with an indeterminate ontological status.

In order to distinguish [m] the properties F^+/F^- from [n] the substances mF^+/mF^- (enmattered properties, i.e. the compounds of, respectively, the properties F^+/F^- and of the primary matter "m"), Aristotle provides [o] an argument related to change. In a nutshell, Aristotle claims that the items in [m] are different from the items in [n], for mF^+ and mF^- (enmattered properties) change

into each other, whereas F^+/F^- do not change into each other (by themselves, but rather only coincidentally, namely on condition that mF^+ and mF^- have changed into each other, and F^+/F^- belong to mF^+/mF^-).

In conclusion, primary matter is in *GC.II.1* is the primary potential substrate of the primary contraries (hot/cold, dry/moist). As such, it is different from contrariety and indeterminate, for, considered in itself, namely with relation to potentiality, it does not coincide with contrariety. This does not amount to claiming that primary matter is an indeterminate body existing in actuality. Rather, with relation to actuality, the primary constituents of the natural sublunary world are the four elements. If we analyse natural things with relation to matter, their primary actual and determinate substrate coincides with the four elements. Although the four elements are the primary existing bodies, they are not primary in general. With relation to potentiality, they are composed out of a primary and indeterminate matter. Primary matter is indeterminate with relation to actuality, for, as an element of the four elements that is only potentially, it is not determinate in actuality. With relation to potentiality, primary matter is instead the determinate capacity for the four primary contrarieties, and is thus capable to qualify as the primary potential substrate of the natural world. Nonetheless, even though, being the primary substrate of the natural world, primary matter is primary with relation to the four elements and with relation to contrariety, still primary matter is not ontologically independent from contrariety and from the four elements. In fact, it is only intertwined with contrarieties, for it is the capacity for the four primary contrarieties. Moreover, primary matter exists (actually) only dependently on the existence of the four elements. Thus, primary matter does not exist (actually) independently of the four elements and of contrariety.

Primary matter, as it is what it is only potentially, does not identify with the primary matter endorsed by most of the predecessors, for it is not one (or some, or all) of the four determinate elements. As a potential being, primary matter is not an actually determinate being as the four elements are. Thus, primary matter is not a contrary.

Nonetheless, as primary matter is the determinate capacity for the primary contraries (and not another determinate capacity, or an indeterminate capacity for just anything), primary matter is what is capable to be the substrate of a particular set of actual beings (the four elements) and of a certain kind of reality, namely of the perceptible natural world. Therefore, primary matter is not

the actually-existent body devoid of any determination endorsed by Anaximander, (possibly) by the thinkers of the intermediate and by Plato. Aristotle's primary matter is rather the determinate capacity for the primary opposition underlying the four elements as their proximate substrate and the natural sublunary world as its remote matter. As such, it is in actuality nothing existent as such and nothing determinate, as it is something determinate only potentially, or as a capacity.

4.2.2.3.5. Conclusion.

In the previous discussion, I have shown that Aristotle is committed to the view that all sublunary, natural things are composed out of the four elements. Nonetheless, Aristotle is also committed to the claim that the four elements are not simple entities. Rather, the four elements are in turn composed out of a primary matter, which functions as the bearer of the primary contraries that proper to each element.

As the primary matter that is common to the four elements is not determined by any contrary in actuality, this matter is indeterminate with relation to actuality. Nevertheless, this does not amount to endorsing the view that primary matter is indeterminate *tout court*. In fact, primary matter is not devoid of any determination and contrariety *in general*, i.e. both in potentiality and in actuality. On the contrary, primary matter, i.e. the matter underlying the so-called primary elements of natural sublunary world, is indeterminate in actuality, but determinate in potentiality. The determinacy proper to primary matter amounts to possessing the capacity for the two primary pairs of contraries shaping the natural sublunary world: hot/cold and dry/moist. Thus, what qualifies as the primary substrate of the natural sublunary world is not any matter whatsoever, or a primary matter devoid of any determination. What qualifies as the primary substrate of the natural sublunary world is rather a determinate kind of matter that possesses the determinate capacity for the four primary contraries.

Let us come back to the positions held in the debate on primary matter, in order to assess whether and to what extent the analysis of *GC.II.1-5* confirms or rejects them.

With relation to the anti-traditionalist view on prime matter, it has become clear that Gill conflates the claim that the four elements are the simplest bodies with the claim that they are

simple *tout court*. Rather, the four elements are hylomorphic compounds analysable into primary matter contrariety. Thus, Gill cannot make sense of claims [l-n].

The assessment of the traditionalist view with relation to the doctrine of *GC.II.1-5* must be a nuanced one. First, the traditionalists who employ *GC.II.1-5* as evidence, get the scope of this text wrong. The scope of *GC.II.1-5* is, in fact, to grasp the basic principles of natural, sublunary reality. Therefore, *GC.II.1-5* cannot be used as evidence for the existence of a prime matter of *all* beings. I have claimed that the text, instead, provides evidence for Aristotle's endorsement of a primary substrate underlying the four elements and natural, sublunary reality in its entirety. I have labelled this concept as "primary matter" in order to differentiate it from the traditional prime matter.

This notwithstanding, the general traditional picture has appeared to be confirmed by *GC.II.1-5*. Primary matter is an indeterminate, potential nature. It does not exist as an actual, indeterminate being, but exists as the potential aspect of natural, sublunary, determinate reality. As such, critics of its internal consistency do not seem to do justice to Aristotle.[113] Critics of the philosophical importance of prime matter, instead, seem to have a point.[114] I believe, nonetheless, that their point about prime matter does not affect primary matter. Primary matter is indeterminate in actuality, but determinate in potentiality. As a determinate capacity for a determinate set of properties (i.e. the four primary contraries), primary matter is something and not a nothing; moreover, possessing determinate properties, it qualifies as a positively determinate tool with philosophical significance. This significance lies both in providing a bearer to the essential properties defining the four elements and in distinguishing natural sublunary realty from other kinds of enmattered realities, such as the heavens, whose primary matter, the ether, is endowed with a different kind of capacity from the primary matter of the element.

In conclusion, *GC.II.1-5* endorses the Alterity condition for matter. Although the primary material bodies (i.e. the four elements) are contraries, *GC.II.1-5* advocates the necessity of positing a primary matter underlying the four elements, and thus the whole natural, sublunary world. Since the primary matter is the substrate underlying the whole set of the contraries, it is necessarily not a contrary itself, for otherwise it would be annihilated by its contrary.

[113] Williams 1982, pp.211-9.
[114] Charlton 1983.

Thus, although the primary material bodies (the four elements) do not constitute an exception to the First horn of the aporia on the number of natural principles, their underlying primary matter does. *GC.II.1-5*, thus, confirms the idea put forward by Args.1-2 of *Phys.I.6* that the substrate must be different from contrariety, ruling out the First horn of the aporia on the number of principles.

CH.5. ARISTOTLE'S TRIAD OF PRINCIPLES. MATTER, FORM AND PRIVATION.

5.1. Introduction: Setting the enquiry.

This introductory section has the role of setting the scope and object of *Phys.I.7*, as well as the main conceptual distinctions shaping the argument developed in the chapter.

5.1.1. What is enquired into.

Phys.I.7 is, with good reason, the chapter of *Phys.I* that has attracted most strongly the attention of scholars. And this for a series of good reasons, first and foremost because it most clearly presents the result of the enquiry pursued in *Phys.I*. Two tendencies with relation to the scope of *Phys.I* are prevailing. The first tendency consists in interpreting *Phys.I.7* as a treatment of substantial change (coming into being).[115] The second tendency is to interpret *Phys.I.7* as a key text of Aristotle's hylomorphism.[116] The first tendency of scholarship endorses that the analysis of change is the aim of *Phys.I*. The second tendency of scholarship endorses that the being of natural things is what is at stake in *Phys.I*.

With relation to the first tendency of scholarship, it is beyond doubt that *Phys.I.7* accomplishes an analysis of change in general, and of substantial change in particular. In setting the topic of the enquiry, *Phys.I.7* opens with three claims.

[115] Waterlow 1982; Code (forth.); Henry 2015.
[116] Ebrey (unpublished), Kelsey 2010.

Phys., I.7, 189b30-2

> Ὧδ' οὖν ἡμεῖς λέγωμεν πρῶτον περὶ πάσης γενέσεως ἐπελθόντες· ἔστι γὰρ κατὰ φύσιν τὰ κοινὰ πρῶτον εἰπόντας οὕτω τὰ περὶ ἕκαστον ἴδια θεωρεῖν.
>
> Thus, we now say [how the difficulty is solved], first by approaching coming to be in general, for it is according to nature to speak first of the things that are common, and thus to contemplate what is proper to each single case.

The first claim is that Aristotle is going to speak with his own voice. This may seem incompatible with my claim that *Phys.I.5-6* contain arguments and results that Aristotle is willing to endorse in *Phys.I.7*. I think that it is neither the case that the arguments of *Phys.I.5-6* are dialectical ones, nor that they are unbiased by dialectical assumptions. These dialectical assumptions do not undermine the validity of the arguments contained in *Phys.I.5-6*, but require Aristotle's own weighing and assessing their force. As the dialectical assumptions of *Phys.I.5-6* are also responsible for the aporia on the number of natural principles, Aristotle's assessment in *Phys.I.7* also solves the aporia.

The second claim is that the starting point of the enquiry is coming to be in general. The connected third claim is that the enquiry proceeds from change in general to what is proper to each specific case of change. Thus, *Phys.I.7* naturally divides itself into two macro-sections. The first one deals with change in general and with the conceptual tools required for its analysis (189b32-190a31). The second one (190a31ff.) lays down the difference between non-substantial and substantial change, and focuses on the analysis of substantial change, which constitutes the aim of *Phys.I.7*.

Although it can hardly be denied that the analysis of change has the lion's share in the economy of *Phys.I.7*, I doubt that the principles of substantial change are the only aim of the enquiry of *Phys.I.7*. Rather, the analysis of substantial change reveals itself to be an ontological analysis of the substances functioning as starting points and end points of substantial change. The principles searched for in *Phys.I.7* are not – or better, are not only – the principles of coming into being. Rather, they are the principles of change and being with relation to substance; namely, the principles of coming into being and of the ontological composition of natural things.

This analysis not only yields the principles of natural things with relation to substance, but also constitutes a means to assess the relation among the substrate and the opposites, and thus a means to solve the aporia raised in *Phys.I.6*.

5.1.2. The two projects of *Phys.I.7*.

I believe that *Phys.I.7* pursues two projects. On the one hand, *Phys.I.7* provides Aristotle's solution to the aporia on the number of natural principles raised in *Phys.I.6*. On the other hand, it accomplishes Aristotle's own doctrine of the natural principles. The accomplishment of both projects entails a strong continuity between the arguments of *Phys.I.5-6* and *Phys.I.7*.

I have shown that Aristotle is committed, at least to some extent, to the validity of the arguments in *Phys.I.5-6*. *Phys.I.7* does not provide any independent argument for the identification of the natural principles. Rather, the aim of *Phys.I.7* is to refine the material on the identity and number of the natural principles provided by *Phys.I.5-6*. Since this material presents a certain degree of internal antinomy leading to the aporia on the number of natural principles, the project of refining the material of *Phys.I.5-6* overlaps with the project of solving the aporia.

A conclusive remark of *Phys.I.7* contains some evidence for the overall project of *Phys.I.5-7*.

> *Phys.*, I.7, 191a14-19
>
> ταῦτα δὲ πῶς δύο καὶ πῶς πλείω, εἴρηται ἐν τοῖς ἄνω. πρῶτον μὲν οὖν ἐλέχθη ὅτι ἀρχαὶ τἀναντία μόνον, ὕστερον δ' ὅτι ἀνάγκη καὶ ἄλλο τι ὑποκεῖσθαι καὶ εἶναι τρία· ἐκ δὲ τῶν νῦν φανερὸν τίς ἡ διαφορὰ τῶν ἐναντίων, καὶ πῶς ἔχουσιν αἱ ἀρχαὶ πρὸς ἀλλήλας, καὶ τί τὸ ὑποκείμενον. […] ἀλλ' ὅτι αἱ ἀρχαὶ τρεῖς καὶ πῶς τρεῖς, καὶ τίς ὁ τρόπος αὐτῶν, δῆλον. πόσαι μὲν οὖν καὶ τίνες εἰσὶν αἱ ἀρχαί, ἐκ τούτων θεωρείσθωσαν.
>
> It has been said above in which way these [the principles] are two and in which way they are more than two. First, it has been said that the principles are only the contraries; then, that it is necessary that something different underlies, and that they are three. From what has been said now, it is clear what the difference between the contraries is, how the principles are related to each other and what the substrate is. […] But it is clear that, and how, the principles are three, as well as their mode. It has been observed above how many, and which ones, the principles are.

Lines 14-5 state the success of the first project of *Phys.I.7*, namely the solution of the aporia of *Phys.I.6*. The solution consists in explaining in which sense the principles are only the contraries (First horn) and in which sense it is true to say that they are the contraries and the substrate (Second horn). Adding to this, lines 20-22 conclude that three topics have been assessed thus far: the number of natural principles, their identity and their mode. The first and the third points are directly accomplished by *Phys.I.7*. The second point, I believe, is the product of the arguments of *Phys.I.5-6* and of the process of their refinement unfolded in *Phys.I.7*. Some evidence for this claim can be gained from the preceding lines.

Lines 15-7 contain a backward look at *Phys.I.5-6*. These chapters have concluded that principles are, respectively, only the contraries and also the substrate. The "only" (μόνον) in line 16 should be taken as qualifying the conclusion of *Phys.I.5* rather than as referring to the stage of the argument. In other words, μόνον does not express, I believe, that the third principle has not yet been argued for in *Phys.I.5*. Rather, it clarifies that *Phys.I.5* concludes that contraries are *the only* principles of natural things.

Lines 17-9 recapitulate three main results of *Phys.I.7*. The list must not necessarily be understood as complete, but it is certainly of importance. The results presented are: (a) assessing the difference between the contraries; (b) clarifying the reciprocal relation enjoyed by the three principles; (c) clarifying what the substrate is.

I claim that *Phys.I.5-6* provide the raw material for the triad of the principles of natural things gained in *Phys.I.7*. This raw material consists of the basic idea that principles are the opposites and the substrate.

As I have claimed, the main task of *Phys.I.7* is to determine the principles proper to the natural substances that have come into being (of the end points of substantial change). This entails a major shift from the enquiry contained from *Phys.I.5* to *Phys.*, I.7, 190a31, concerning the end point and starting point of change in general.

Thus, the refinement of the raw material of *Phys.I.5-6* accomplished by *Phys.I.7* through (a-c) is to be understood as realising this shift towards the principles of natural substance. In what follows, I show how (a-c) accomplish the shift towards substance realised in *Phys.I.7*, and thus the refinement of the results of *Phys.I.5-6* into the principles of natural substance.

5.1.3. How the two projects accomplished in *Phys.I.7* are actually one single project.

In the previous sections, I have claimed that *Phys.I.7* pursues two projects by virtue of achieving (at least) three tasks (a-c). These two projects are actually one single project, for the material of Aristotle's doctrine of natural principles is argued for in *Phys.I.5-6*, whose conflicting arguments give raise to the aporia whether the opposites exhaust the kind of the natural principles or whether the substrate must be added to the count. Thus, clarifying whether the substrate should

be reduced to the opposites, thus answering the aporia, overlaps at least partially with the project of bringing the doctrine of the natural principles to its accomplishment. In the next three sections (5.1.5.a-c.), I show how each of these tasks is instrumental both in solving the aporia on the number of natural principles and in bringing the doctrine of the natural principles to its completion.

5.1.3.a. The refinement of the concept of opposition qualifying as a principle.

(1) In one sense, task (a) consists in assessing in which different ways and to what different extent each of the two opposites, i.e. form and privation, qualifies as principles. In *Phys.I.5-6*, the contraries qualify as principles to the same extent. *Phys.I.7*, instead, draws a distinction. In a nutshell, privation is said to be a principle only coincidentally, whereas form qualifies as a principle without restriction. The difference in etiological status between form and privation can be explained by virtue of (b) the clarification of the relation of the three principles to each other. Part of the results gained with relation to (b) is that privation can be reduced, to some extent, both to the substrate and to the form. Thus, in one sense, the task of clarifying (a) "the difference between the contraries" undertaken in *Phys.I.7* consists in assessing that form and privation are endowed with different etiological statuses.

(2) In another sense, task (a) consists in the progressive refinement of the concept of opposition qualifying as a principle of natural things. *Phys.I.5* first considers (188a30-b8) the narrow concept of contrariety (white/black; musical/unmusical), to further consider (188b8-23) substantial opposition (being-joined and non-being-joined); being-composed and being-scattered; formedness and formlessness). To be sure, substantial opposition is presented as a pre-technical notion in *Phys.*, I.5, 188b8-23. Namely, it is not explicitly thematised with relation to substantial change, for substantial change is distinguished from non-substantial change only in *Phys.I.7*. Two plausible explanations for this are the following ones.

First, Aristotle pursues in *Phys.I.5-6* a general heuristic project that, according to the method put forward in *Phys.I.1*, is still in its καθόλου phase and has not yet reached its analytic diversification (i.e. its καθ' ἕκαστα phase). Thus, Aristotle's aim in *Phys.I.5-6* is to find the principles of natural things regardless their categorical difference.

Second, a favourite critical target for Aristotle is the failure of the theories of change of his predecessors with relation to their capability to detect the difference between substantial and non-substantial change. In *GC.*, I.1, 314a3ff, for example, Aristotle confronts his predecessors with the charge of explaining away substantial change through non-substantial change. In 314b2ff, he divides the predecessors into two groups, the first one reducing substantial change to alteration, the second one to aggregation and separation. The failure of *Phys.I.5-6* to acknowledge the specificity of substantial change may hinge on the fact that *Phys.I.5-6* is partially dependent on the conceptual framework inherited from the predecessors. Aristotle's general project of drawing the truth underlying the theories of his predecessors and providing his own argument for it entails a temporary and partial acceptance of the conceptual framework of the predecessor.

The two arguments against the First horn of the aporia contained in *Phys.*, I.6, 189a21-b1 first take up the narrow concept of contrariety in play in *Phys.*, I.5, 188a30-b8. Then, *Phys.I.6* presents a reduction of the contraries qualifying as principles to the general pair of excess and defect. By virtue of analogy, Aristotle claims, each term of a contrary pair is related to the other in the same way as excess is related to defect. This analogical reduction is telling on two grounds.

First, it anticipates in a pre-technical terminology (excess/defect) the opposite pair of form/privation that are members of the definitive triad of principles selected in *Phys.I.7*. Spelling out contrariety as the opposition of excess and defect is in fact a first move towards the opposition of form and privation introduced in *Phys.I.7* in order to account for the substance of natural things. As I have claimed (cf. §4.2.1.), there is good reason for denying that substantial forms have a contrary. Rather, a substantial form is opposed to privation in a different way than contraries are opposed to each other. Introducing form and privation in place of contrariety accounts for the substance of natural things, with relation to both their capacity to change and to their being (or composition).

Second, the reduction of contraries to excess and defect entails a reflection on the difference between the members of each contrary pair of principles. In fact, the contraries in play in *Phys.I.5-6* are reduced analogically into two columns. In *Phys.*, I.7, 191a3-7, where form and privation are said to be two modes, namely presence and absence, of one single item, the form.

The result of this process is that privation, after having been declared a principle only coincidentally with relation to the substrate, is further excluded from the number of the non-coincidental principles by virtue of its reducibility to form.

In conclusion, task (a) is instrumental to the two projects pursued in *Phys.I.7*.

With relation to the solution of the aporia of *Phys.I.6*, (a) spells out the possibility to reduce the opposite principles to matter and form, on the ground that privation is merely coincidental.

With relation to the accomplishment of Aristotle's theory of the natural principles, task (a) both expands the theory to include substance and clarifies that form and privation have a different etiological status.

5.1.3.b. Task (b): clarifying the reciprocal relations enjoyed by the three principles.

The main task undertaken by *Phys.I.7* consists in clarifying the relation that matter, form and privation enjoy with each other.

(1) A main result is gained through the analysis of the starting point and end point of coming into being. In *Phys.*, I.7, 190b10-1, Aristotle assesses that everything undergoing change is a composite being, for necessarily a substrate must underlie what changes. The starting point of change can be considered, numerically, as what lacks a certain form; by account, it is twofold, namely privation and matter. Similarly, the end point of change can be considered, numerically, as what is formed; by account, it is twofold, namely matter and form.

Thus, the aporia on the principles of natural thing is solved in so far as we consider the principles either numerically (privation and form) or with relation to their difference in account (privation, form and matter).

(2) The passage from *Phys.I.5-6* to *Phys.I.7* entails a refinement of the internal relation among the principles. The coincidental predication in play in Arg.2 of *Phys.I.6* has shown that, if the substrate is posited as a principle, the contraries fail to qualify as such, for they are posterior to the substrate they are predicated of. Whereas the result of Arg.1 of *Phys.I.6* (i.e. the claim that, for change to be possible, there must be a substrate underlying the opposites) is crucial in *Phys.I.7* (cf. §5.5.1.), the result of Arg.2 might seem to be dropped. In fact, *Phys.I.7* posits matter

and form on the same footing. Moreover, the question on the priority of either form or matter is left undecided in *Phys.I*.

These negative results suggest that *Phys.I.7* understands the relation between matter, form and privation in a different way than *Phys.I.6*. If coincidental metaphysical predication in *Phys.I.6* entails the priority of the substrate (i.e. of substance) over its properties, the fact that matter and form are on the same footing suggests that the reciprocal relation is of a different kind than the previous one. I label the relation between matter and form (and matter and privation) substantial metaphysical predication, since all three parties involved are, to some extent, substances, and since their reciprocal relation is not coincidental.

Other texts expand on the relation between matter and form. A key-strategy developed in *Metaph.VIII.6* seems to be that form is said of matter according to an identity predication of the kind: M is potentially what F^{+} is actually.

The negative result of *Phys.I.7* seems to place *Phys.I* on the way from the substace-properties ontology of the *Categories* and more mature treatments of hylomorphism such as *Metaph.VIII*. *Phys.I* ascertains the existence of a level of analysis below the substance-properties relation of the *Categories*, and denies that matter and form stand in a relation of coincidental metaphysical predication. How the relation between matter and form can be spelled out remain, nonetheless, a topic for further study.

5.1.3.c. Task (c): clarifying what the substrate is.

As a matter of fact, a central part of Aristotle's endeavour to find the principles of natural things and to solve the aporia on the number thereof consists in clarifying what matter is. The Second horn itself derives from the conceptual necessity to posit a matter and substrate that are different from the opposition that endows them. Aristotle's hesitation to endorse the Second horn straightaway depends, I have claimed, on the difficulty of positing a substrate/matter that is itself different from the opposites.

The determination of the nature of the substrate/matter goes through the following steps. In Args.1-2 of *Phys.I.6*, the substrate/matter is introduced on two grounds. Namely, both in order to

solve the impossibility for contraries to qualify as subjects of change and as substances. Moreover, *Phys.I.6* puts forward the requirement for substrate to be different from the opposition, and weighs the failure of the theories of the predecessors according to their failure to safeguard this difference (*Phys.*, I.6, 189b2-11).

A major endeavour of *Phys.I.7* lies in assessing the difference between matter and privation constituting the starting point of change, namely in differentiating "the black" in its elements: the substrate undergoing change (e.g. the man) and the property black inhering in the substrate. If this difference is rather clear with relation to the starting point of non-substantial change, it gets fishier and fishier the more we deal with low-layered substantial changes. If we consider the case of a statue coming into being through the acquisition of a figure out of the figurelessness of a lump of bronze, spotting the difference between the figurelessness and the bronze may be an easy task. Regardless of the variety of shapes the figurelessness of the bronze may take before being moulded into the figure of the statue, the bronze is a definite material substance, whereas the figurelessness is a negative determination of the form of the statue. If we consider elemental change, instead, conceiving a matter that is different from the primary contraries defining each element becomes fishier. I have shown that this is a controversial issue among the predecessors, and that the invention of primary matter as a potential substrate of the four elements different from the primary contraries is the endeavour of *GC.II.1*.

5.2. The introduction of conceptual distinctions.

Phys., I.7, 189b32-190a13 introduces conceptual distinctions that are instrumental to the achievement of the two projects pursued in *Phys.I.7*. Namely, the solution of the aporia on the number of natural principles and the refinement of the results of *Phys.I.5-6* into the triad of matter, form and privation.

5.2.1. First distinction: being simple vs being composite. Second distinction: starting point vs end point of change.

> *Phys.*, I.7, 189b32-190a5
>
> φαμὲν γὰρ γίγνεσθαι ἐξ ἄλλου ἄλλο καὶ ἐξ ἑτέρου ἕτερον ἢ τὰ ἁπλᾶ λέγοντες ἢ τὰ συγκείμενα. λέγω δὲ τοῦτο ὡδί. ἔστι γὰρ γίγνεσθαι ἄνθρωπον μουσικόν, ἔστι δὲ τὸ μὴ μουσικὸν γίγνεσθαι μουσικὸν ἢ τὸν μὴ μουσικὸν ἄνθρωπον ἄνθρωπον μουσικόν.
>
> ἁπλοῦν μὲν οὖν λέγω τὸ γιγνόμενον τὸν ἄνθρωπον καὶ τὸ μὴ μουσικόν, καὶ ὃ γίγνεται ἁπλοῦν, τὸ μουσικόν· συγκείμενον δὲ καὶ ὃ γίγνεται καὶ τὸ γιγνόμενον, ὅταν τὸν μὴ μουσικὸν ἄνθρωπον φῶμεν γίγνεσθαι μουσικὸν ἄνθρωπον.
>
> And we say, in fact, that something comes to be out of something other, and that something comes to be out of something different. And these things we mentioned are either simple or composite. And I mean this way: it is the case that man comes to be musical, and that the unmusical comes to be musical or that the unmusical man comes to be musical man.
>
> And I say what-comes-to-be as simple: the man and the non-musical; what-has-come-to-be: the musical. [We say] what-has-come-to-be and what-comes-to-be as composite things, when we say that the non-musical man comes to be the musical man.

The passage opens with a collection of ways in which we commonly describe coming to be. The three ways mentioned share the common two-place pattern "x γίγνεται y", where x and y stand for the two kinds of items selected by *Phys.I.5-6* as sources, either singularly or in conjunction. Namely, x can be filled either with a contrary or with a substrate or with the conjunction of them; y can be filled either with a contrary or with the conjunction of a substrate and a contrary.

Aristotle's reference to the way in which we commonly speak of coming to be has been idiosyncratically interpreted by Wieland *et all.* as bearing the burden of proof for the result of *Phys.I.7*.[117] Far from being so, 189b32-190a1 most clearly takes up both source conditions for natural change stated in Arg.2 of *Phys.I.5* (188a30-b8). The reference to change between others (ἐξ ἑτέρου ἕτερον) picks up the necessary otherness condition. The reference to change between things that are different (ἐξ ἑτέρου ἕτερον) picks up the sufficient condition. The reference to the substrate obviously refers to the result of Arg.1 of *Phys.I.6* rather than to linguistic analysis. Thus, 189b32-190a1, instead of invoking historically accidental linguistic structures as evidence for a metaphysical claim, actually make reference to what has been achieved by argument in the preceding chapters.

[117] See §0.4.

The distinction between the starting point and end point of change marked in *Phys.I.5* by the particles ἐκ/εἰς is labelled in our passage, respectively, by the expressions τὸ γιγνόμενον and ὃ γίγνεται. These expressions undergo changes throughout *Phys.I.7*, and the former one is ambiguous. In our passage, it designates the starting point of change, whereas, in a later passage (190b9-17), it applies to the things undergoing change in general. These, in turn, are said to include both the starting point (τι γιγνόμενον) and the end point of change (τι ὃ τοῦτο γίγνεται), labelled with two slightly modified expressions.

Further, the first conceptual distinction is connected with the second distinction. This distinction might also seem to be anticipated in *Phys.I.5*, namely in the difference between simple contraries (cf. §2.1.) and composite contraries (cf. §2.2.). This is nonetheless mere appearance. In fact, *Phys.*, I.5, 188b8-23 analyses contraries that are in themselves composite of conceptual parts. Formedness and formlessness refers to the composition of formal parts (e.g. of the head, arms, legs and torso of the statue). The kind of composition addressed in our passage is, instead, the composition of the contraries with the substrate advocated in *Phys.I.5* and *Phys.I.6*.

5.2.2. Third distinction. Two ways of qualifying the starting point of change: "x comes to be y", "y comes to be out of x".

Phys., I.7, 190a5-8 introduces two ways of qualifying the starting point of change with relation to coming to be.

> *Phys.*, I.7, 190a5-8
>
> τούτων δὲ τὸ μὲν οὐ μόνον λέγεται τόδε γίγνεσθαι ἀλλὰ καὶ ἐκ τοῦδε, οἷον ἐκ μὴ μουσικοῦ μουσικός, τὸ δ' οὐ λέγεται ἐπὶ πάντων· οὐ γὰρ ἐξ ἀνθρώπου ἐγένετο μουσικός, ἀλλ' ἄνθρωπος ἐγένετο μουσικός.
>
> And out of these, something is not only said to come to be this, but also to come to be out of this, e.g. the musical comes to be out of the non-musical. Nonetheless, this does not apply to all of them. For musical does not come to be out of man, but man comes to be musical.

In common speaking praxis on coming to be, we do not use only the formula "x γίγνεται y" in play in the preceding lines. Rather, the starting point of change is referred to either directly or indirectly, namely by adding the preposition ἐκ. Thus, the general mode of speaking about coming to be can be summarised into the formula "(ἐκ) x γίγνεται y", meaning that the starting

point of change is: either considered as the subject of the formula "x γίγνεται y"; or as the provenance of the subject of change.

Through the observation of the speaking praxis in the case of the example of the non-musical man coming to be musical man, the First, Second and Third distinctions overlap in the following way. For the starting point of change (x) considered as a simple item: the contrary allows for both ways of speaking about change, whereas the substrate allows only for the pattern "x γίγνεται y".

5.2.3. Fourth distinction. Persistence and non-persistence of the starting point of change.

This distinction has become highly controversial since Barrington Jones refuted, in an influential paper, the traditional belief that the substrate persists through substantial change. Both sides have found their champions in successive scholarship, and even today the debate is far from waning.

I discuss the topic of the persistence of the substrate in substantial change in §5.6. In *Phys.*, I.7, 190a9-13, the distinction between what-comes-to-be persisting through change and what-comes-to-be without persist is drawn with relation to non-substantial change.

> *Phys.*, I.7, 190a9-13
>
> τῶν δὲ γιγνομένων ὡς τὰ ἁπλᾶ λέγομεν γίγνεσθαι, τὸ μὲν ὑπομένον γίγνεται τὸ δ' οὐχ ὑπομένον· ὁ μὲν γὰρ ἄνθρωπος ὑπομένει μουσικὸς γιγνόμενος ἄνθρωπος καὶ ἔστι, τὸ δὲ μὴ μουσικὸν καὶ τὸ ἄμουσον οὔτε ἁπλῶς οὔτε συντεθειμένον ὑπομένει.
>
> And out of what-comes-to-be, and comes to be as a simple thing, we say, on the one hand, that something comes to be persisting; on the other hand, that something comes to be without persisting. In fact, on the one hand, the man persists [being] man while coming to be musical, and is [man] [or: and [still] exists]. On the other hand, the non-musical and the unmusical do not persist either as simple beings or as composite beings.

On the basis of the previous distinctions, Aristotle is here concerned with the starting point of change only, first considered as simple (i.e. either as the substrate or as the contrary), then as composite.

When the unmusical man comes to be the musical man, the substrate (the man) persists, whereas the contrary (both as a simple and as a composite – the unmusical and the unmusical man) does

not persist. That the claim is presented as a plain fact is evident from the lack of inferential particles.

The evidence of the claim is supported by the following consideration. According to *GC.I.2*, non-substantial change is a change with respect to the non-substantial properties pertaining to a certain substance, whereas substantial change is a change with relation to the substrate or the form. By definition, the substrate of the properties undergoing change persists as such and remain unchanged. Evidently, when the man comes to be musical, it does not cease to be man. Rather, man persists through coming to be, so that the end point of change consists of the same man that has come to be musical.

The persistence or lack of persistence of the starting point of change is assessed, I believe, by the words καὶ ἔστι at line 11. The καί may well be considered as epexegetic, and the ἔστι may mean either existence or identity. If the former is the case, the man persists, if it [still] *exists* in the end of the process of change. If the latter is the case, the man persists, if it *is identical* (in its essence) with the man of the end point of change.

Thus, what is the starting point of change at t^1 (x) persists through change on either of these two conditions:

existential condition (weaker): x persists through change, if x still exists at t^2; or:

identity condition (stronger): x persists through change, if x is identical with x at t^2.

The existential condition and the identity condition evidently coincide in the case of non-substantial change, for non-substantial change does not mutate the nature of the substrate, but only its non-substantial properties. In the case of substantial change, it is not clear how far the two conditions may coincide, for substantial change is a mutation of the starting point of change with relation to its substance.

In conclusion, the substrate persists through non-substantial change, for it exists and is identical to itself both in the starting point of change and in the end point of change. The contrary does not persist in the end point of change, for it is substituted by its contrary.

5.2.4. Fifth distinction. Substantial change vs non-substantial change.

After having introduced the first result of *Phys.I.7*, namely that the starting point of change in general is one in number and twofold in being, and before extending the result to the case of substantial coming to be, Aristotle distinguishes between substantial and non-substantial change. Here, I merely flag this difference, which is of major importance.

> *Phys.*, I.7, 190a31-3
>
> πολλαχῶς δὲ λεγομένου τοῦ γίγνεσθαι, καὶ τῶν μὲν οὐ γίγνεσθαι ἀλλὰ τόδε τι γίγνεσθαι, ἁπλῶς δὲ γίγνεσθαι τῶν οὐσιῶν μόνον […].
>
> And coming to be is said in many ways. And out of these, on the one hand, [things] not [only] come to be, but come to be this; on the other hand, [things] come to be simply, and this is proper to substances only.

The text presents a common claim in Aristotle's treatment of change, namely that change is not a univocal term. Rather, it is said both transitively and intransitively (or *simpliciter*).

In the first sense – which is expressed by the general formula "(ἐκ) x γίγνεται y" employed so far –, something changes into something else, i.e. "comes to be this (τόδε τι)". The expression τόδε τι is here used quite ambiguously, since it is extensively used to mean substance through the *Corpus*. In this passage, instead, it evidently stands for a non-substantial feature acquired through the process of change.

In the second sense, change is meant as intransitive, substantial coming to be in the form of coming to be *simpliciter* (ἁπλῶς). I refer to this kind of change as "coming into being", along with the expressions "substantial change/substantial coming to be".

Coming to be, evidently, does not share the same linguistic structure with coming to be ("(ἐκ) x γίγνεται y"). Rather, coming into being is expressed by the one-place formula "y γίγνεται". Aristotle's attempt throughout *Phys.I.7*, nonetheless, is to normalise coming into being by virtue of assimilating it to coming to be (something). Thus, the one-place pattern proper to substantial change is resolved into the two-place pattern of non-substantial change. When y comes into being, there is a matter (M) that is endowed with the privation of the form of y (F^-) at t^1, and takes on the form of y (F^+) at t2, thereby losing F^-.

5.3. The analysis of the starting point of change in general. Substrate and privation as principles.

The analysis of the starting point of change has already gained important elements in the previous section (§5.2.) This section is declared concluded in line 190a13, which marks the transition from the collection of conceptual differences (189b32-190a13) to the analysis of the starting point of change (190a13-b17) on the basis of the conceptual distinctions previously achieved.

According to the program set out at the opening of *Phys.I.7* (189b30-2) reaching from what is general to what is particular, the analysis of change first deals (190a13ff.) with what is common to all change, before turning to what is proper to substantial change (190a31ff.) The latter represents the culmination of the enquiry on natural principles of *Phys.I.*

This move engenders a difficulty, insofar as the analysis of change in general stems from consideration of non-substantial change, the case of an unmusical man coming to be musical. The question arises, whether the conclusions drawn from this case ([a]-[c] below) are also valid for the case of substance and substantial change.

> *Phys.*, I.7, 190a13-21
>
> διωρισμένων δὲ τούτων, ἐξ ἁπάντων τῶν γιγνομένων τοῦτο ἔστι λαβεῖν, ἐάν τις ἐπιβλέψῃ ὥσπερ λέγομεν, ὅτι [a] δεῖ τι ἀεὶ ὑποκεῖσθαι τὸ γιγνόμενον, καὶ [b] τοῦτο εἰ καὶ ἀριθμῷ ἐστιν ἕν, ἀλλ' εἴδει γε οὐχ ἕν· τὸ γὰρ εἶδει λέγω καὶ λόγῳ ταὐτόν· οὐ γὰρ ταὐτὸν τὸ ἀνθρώπῳ καὶ τὸ ἀμούσῳ εἶναι. [c] καὶ τὸ μὲν ὑπομένει, τὸ δ' οὐχ ὑπομένει· τὸ μὲν μὴ ἀντικείμενον ὑπομένει (ὁ γὰρ ἄνθρωπος ὑπομένει), τὸ μὴ μουσικὸν δὲ καὶ τὸ ἄμουσον οὐχ ὑπομένει, οὐδὲ τὸ ἐξ ἀμφοῖν συγκείμενον, οἷον ὁ ἄμουσος ἄνθρωπος.
>
> And after having drawn these distinctions, this has to be a grasped from what comes to be in general, if one examines the topic in the way we propose. Namely, [a] that there is always something that underlies, i.e. what-comes-to-be; that, [b] if this [what-comes-to-be] is one in number, it is nonetheless not one in form. For I mean by "in form" and "in account" the same thing, and what it is to be for the man and what it is to be for the unmusical are not the same thing. [c] And one of these persists, whereas the other one does not: what is not opposed persists (for the man persists), whereas the non-musical and the unmusical do not persist, nor does what is composed out of both, e.g. the unmusical man.

Three claims are made in 190a13-21 about what comes to be in general.

> [a] there is always a substrate underlying the process of change as a starting point (i.e. as what-comes-to-be);
>
> [b] what-comes-to-be (the starting point of change in general) is one in number, but not one in form (i.e. in account);
>
> [c] of what-comes-to-be [c^1] one part, namely the substrate and what is not opposed, persists; [c^2] the other part, namely what is opposed, does not persist.

Claims [a-c] constitute a coherent unity both on their own and with relation to the results of *Phys.I.5-6*.

The continuity with *Phys.I.5-6* is clear from the following: [a] endorses the truth of the claim that Arg.1 of *Phys.I.6* had argued for in a cautious way, namely that there is something such as a substrate that is not reducible to the opposites, and that qualifies as a principle of change along with the opposites. Claim [b], in turn, endorses both the result of Arg.2 of *Phys.I.5* and that of Arg.1 of *Phys.I.6*, thus arguing that both the substrate and the opposite qualify as starting points of change. Moreover, it clarifies both what the relation between the opposite and the substrate is and how many principles there are under different considerations (numerically and according to form), thus contributing to the solution of the aporia of *Phys.I.6*. [c] is consistent with the rationale for positing the Second horn of the aporia of *Phys.I.6*, namely for not reducing the principles to the opposites alone. In fact, [c^1] to some extent restates the alterity condition of the substrate, by virtue of highlighting the difference between opposites and the substrate with relation to the persistence through change. Since there is starting point of change that does persist and one that does not persist through change, it is evident that, at least with relation to form, there are two different starting points of change: the substrate and the opposite.

As regards the internal unity of [a-c], once [a] is secured, as it is the case that things come to be out of the opposites (cf. Arg.2 of *Phys.I.5*), the necessity arises to explain how many starting points of change there are and what their reciprocal relation is.

[b] accomplishes this task by virtue of explaining that, on the one hand, there is one starting point of change, for the substrate and the opposite coincide numerically. On the other hand, the

starting points are two, for they are different in being (in fact, being man is different from being unmusical). Thus, with relation to number, there is one starting point of change, namely the numerical unity constituted by the substrate and the opposite; with relation to form and being, the starting points of change are two, namely the substrate and the opposite. The difference in being is not the only difference that distinguishes the substrate from the opposite.

In [c], the substrate and the opposite are distinguished with relation to their, respectively, persistence and non-persistence through coming to be. Thus, [c] spells out the diachronic structure of the substrate through the process of coming to be: when something comes to be, [c^1] the substrate that underlay the negative opposite at t^1 is not destroyed, but rather still exists at t^2 and is identical with what it was and is at t^1. In other words, the substrate of coming to be meets both the existential and the identity condition for permanence (§5.2.3.), for the man both exists and is man, when he comes to be musical out of being unmusical. Unlike the substrate, [c^2] the opposite is destroyed in the process of coming to be. In fact, since the opposite at the starting point of change is incompossible with the opposite supervening at the end point of change, the former opposite must be destroyed and does not persist through change. For the opposite constituting the starting point of change fulfils neither the existence nor the identity condition. For instance, when the unmusical man comes to be the musical man, the unmusical neither exists in the musical man nor is identical with it.

This having been clarified, we should consider what the rationale supporting [a-c] is. A common answer, as I have mentioned in §5.2.2, is that Aristotle would draw on the analysis of the way in which we speak about change. The analysis of common language would show us the necessity of endorsing [a-c], due to a robust parallelism between reality and language allegedly assumed by Aristotle.

This interpretation has several disadvantages that are, I believe, damning. First, supporting [a-c] with linguistic structures that are contingent to a certain language in certain contingent geographical and historical coordinates amount to ruling out any claim to necessity of [a-c]. Second, this interpretation endorses an excessively strong claim, namely that language should faithfully reflect reality. Third, it undermines the importance of the rational endeavour of *Phys.I.5-6* and the continuity of [a-c] with the claims argued for in these chapters. Fourth and generally, I believe that this interpretation misrepresents the relation between argument and

common speech about change. I believe that this becomes evident by considering how Aristotle argues for [a] and [c].

In the case of [a], it is clear that linguistic analysis cannot bear the burden of argument. At best, it highlights a pre-philosophical understanding of the difference between the substrate and the negative opposite with relation to the starting point of change. The necessity of a substrate underlying the contraries through change is argued for in Arg.1 of *Phys.I.6*, opposing to Arg.2 of *Phys.I.5*. The arguments of *Phys.I.6*, we have seen, are put forward quite tentatively, for it is unclear whether the substrate should or should not be reduced to opposition. It is clear that, in 190a5-8 of *Phys.I.7*, Aristotle distinguishes between two ways of speaking about coming to be with relation to the starting point of change ("out of x comes to be y", "x comes to be y"), and uses this distinction to highlight the difference between the substrate and the opposite. Nonetheless, admitting that the distinction between two ways of speaking about coming to be is instrumental in highlighting this difference does not amount to assuming that it has the value of an argument. Rather, the decisive argument for [a] is found in *Phys.*, I.7, 190a31-b9, where Aristotle distinguishes between substantial and non-substantial change (lines 31-3; cf. §5.2.4.), and introduces his attempt to extend the κοινά of change gained by analyis of non-substantial change ([a-c]) to the more complex case of substantial change (lines 33ff.). Here, Aristotle admits that [a] does not apply to substantial change as uncontroversially as to non-substantial change. The reason why, instead, [a] evidently applies to non-substantial change is provided by the following argument.

> *Phys.*, I.7, 190a33-b9
>
> […] κατὰ μὲν τἆλλα φανερὸν ὅτι ἀνάγκη ὑποκεῖσθαί τι τὸ γιγνόμενον (καὶ γὰρ ποσὸν καὶ ποιὸν καὶ πρὸς ἕτερον [καὶ ποτὲ] καὶ ποὺ γίγνεται ὑποκειμένου τινὸς διὰ τὸ μόνην τὴν οὐσίαν μηθενὸς κατ' ἄλλου λέγεσθαι ὑποκειμένου, τὰ δ' ἄλλα πάντα κατὰ τῆς οὐσίας)·
>
> […] And with relation to the others [to what is not a substance], it is evident that something must necessarily underlie [ὑποκεῖσθαι], i.e. what-comes-to-be [τι τὸ γιγνόμενον]. For quantity, quality, relation, [time,] and place come to be on condition that there is a certain substrate, because it is only substance that is not said of any other substrate, whereas the others [what is not substance] are all said of substance.

The argument supporting [a] with relation to the case of non-substantial change contained in 190a33-b1 employs the tool of metaphysical predication that is in play in Arg.2 of *Phys.I.6*. There, metaphysical predication concludes that the substrate is prior in being to the contraries,

and therefore principle of being more (or rather) than the contraries. Here, metaphysical predication is employed with the aim of showing that [a] there must be a substrate underlying non-substantial change. The argument hinges most plausibly on the notorious doctrine contained in the fifth chapter of the *Categories* claiming that substance is not predicated of anything, whereas the other categories are predicated of substance.

It is possible to interpret the argument in various ways, and I suggest the following one. According to the kind of metaphysical predication in play in the *Categories*, it is evident that it is not possible to conceive of a starting point of any non-substantial change without positing a substance functioning as a substrate of the opposite that comes to be. Let us consider any non-substantial change of the kind: H^- comes to be (out of) H^+, where H^+ and H^- are a pair of contraries and do not belong to the category of substance; for instance, white and black. Now, let us assume the quality black as the only starting point of a process of change towards white (¬[a]). If this were the case, then a non-substances (black) exists in separation from substance as a free-floating property. But this is evidently impossible. Therefore, [a] there must be a substance underlying every non-substantial change.

Far from endorsing alleged, and in themselves contingent, linguistic arguments, Aristotle grounds the truth of [a] on an a-priori, necessary argument. The argument in 190a33-b1 has the intuitive certainty of an a-priori truth, for it rests on the basic, self-evident principle that non-substances cannot exist separately from substances.

Let us now consider how [c] (the claim that the substrate persists through change) is argued for. Scholars such as Barrington Jones have endorsed that the rationale for Aristotle's persistence claim with relation to the substrate of substantial change rests on the assumption that the Third conceptual distinction ("out of x y comes to be" vs "x comes to be y"; cf. §5.2.2.) and the Fourth conceptual distinction (persistence vs non-persistence of the starting point of change; cf. §5.2.3.) run parallel. Namely, that an ontological claim such as [c] would find justification in the linguistic fact that the substrate is said to change only according to the linguistic pattern "x comes to be y", whereas the opposite is said to change according to both linguistic patterns. In fact, in drawing the Third distinction, Aristotle clarifies that "musical does not come to be out of man, but man comes to be musical" (cf. *Phys.*, I.7, 190a7-8).

Now, if there there is something such as a linguistic argument, it is evident that the way in which we speak about change should shows a consistent regularity. Nonetheless, as it will become evident from the next passage, Aristotle does not hold this view. Therefore, the (in itself unappealing) idea of a linguistic argument must be rejected.

> *Phys.*, I.7, 190a21-31
>
> τὸ δ' ἔκ τινος γίγνεσθαί τι, καὶ μὴ τόδε γίγνεσθαί τι, μᾶλλον μὲν λέγεται ἐπὶ τῶν μὴ ὑπομενόντων, οἷον ἐξ ἀμούσου μουσικὸν γίγνεσθαι, ἐξ ἀνθρώπου δὲ οὔ·οὐ μὴν ἀλλὰ καὶ ἐπὶ τῶν ὑπομενόντων ἐνίοτε λέγεται ὡσαύτως· ἐκ γὰρ χαλκοῦ ἀνδριάντα γίγνεσθαί φαμεν, οὐ τὸν χαλκὸν ἀνδριάντα. τὸ μέντοι ἐκ τοῦ ἀντικειμένου καὶ μὴ ὑπομένοντος ἀμφοτέρως λέγεται, καὶ ἐκ τοῦδε τόδε καὶ τόδε τόδε· καὶ γὰρ ἐξ ἀμούσου καὶ ὁ ἄμουσος γίγνεται μουσικός. διὸ καὶ ἐπὶ τοῦ συγκειμένου ὡσαύτως· καὶ γὰρ ἐξ ἀμούσου ἀνθρώπου καὶ ὁ ἄμουσος ἄνθρωπος γίγνεσθαι λέγεται μουσικός.
>
> And "to come to be out of this" and "not to come to be this" is said prevailingly with relation to what does not persist. For example, "musical comes to be out of unmusical", and not "out of man". Nonetheless, in some cases, "to come to be out of this" is said also with relation to what persists. For we say that "the statue comes to be out of the bronze", not that "the bronze comes to be the statue". And what comes to be out of the contrary, i.e. out of what does not persist, is said in both ways, namely both "this comes to be out of this" and "this comes to be this". For it is the case that both "out of the unmusical" and "the unmusical" [are said to] "come to be the musical". And the same applies also to what is composite, for both "out of the unmusical man" and "the unmusical man" [are said to] "come to be the musical".

In this passage, Aristotle corrects the impression of a perfect parallelism between the two ways of speaking of change and their application to either the substrate or the opposite. In fact, against his previous statement (190a5-8, cf. §5.2.2.), the linguistic pattern "out of x y comes to be" is said to be employed not exclusively to the case in which x is the opposite, but also occasionally (ἐνίοτε) in the case in which x is a substrate. Thus, the linguistic distinction between "this comes to be out of this" and "this comes to be this" does not present the regularity that might allow it to perform the function of proof for [c].

In conclusion, on a negative note, the interpretations assuming something such as alleged linguistic arguments as rationales for [a-c] are both faced with the unappealing consequence of undermining the any claim to necessity of [a-c] and do not find textual support. These are sufficient grounds for denying that alleged linguistic arguments are endorsed as rationales for the ontological claims [a-c].

On a positive note, I have shown that, at least with relation to [a], Aristotle provides an argument hinging on basic a-priori principles, this securing its necessity. I show in §5.6. that Aristotle has solid arguments for [c] that are of a different nature and of a different force than the alleged linguistic arguments attributed to him by commentators.

5.4. From change in general to substantial change. Or rather, from non-substantial change to substantial change.

After having gained the κοινά of change [a-c] (190a13-31), Aristotle approaches his argumentative aim (the analysis of substantial change) by way of setting out the difference between coming to be (non-substantial change) and coming into being (substantial change) (190a31-b1, cf. §5.2.4.) The general strategy of Aristotle's analysis of substantial change seems to lie in extending the κοινά of change ([a-c]) to the particular case of substantial change. The dimension of this extension is, nonetheless, problematic.

On the one hand, [a-c] are presented as the κοινά of change and are therefore expected to apply to substantial change. A main vector of analysis in play in *Phys.I*, I have claimed (cf. §5.1.3.), departs from what is general in order to reach to what is proper to the single case.

On the other hand, despite being presented as the κοινά of change, [a-c] are evidently gained through the analysis of non-substantial change. Non-substantial change seems to function, in *Phys.I.7*, as a model for substantial change, to such an extent that what holds of non-substantial change also extends to substantial change.

This attempt to give account of substantial change by employing the model of non-substantial change is not an isolated one in Aristotle's *Corpus*. In *GC.I.3*, the model of substantial change "Y comes into being" is to some extent reduced to and explained away through the model of non-substantial change, before its peculiarities are spelled out with relation to the other kinds of change (*GC.I.4-5*). The reduction of the one-place model of coming into being to the two-place model of coming to be permits Aristotle to solve the aporia that substantial change should coincide with coming to be out of nothing. By endorsing that the formula "Y comes into being" should be spelled out into the two-place formula "X comes to be Y; or Y comes to be out of X",

Aristotle shows that Y does not come into being from nothing, but rather from something, if X is (cf. *Phys.I.5-6*) either a substrate or an opposite, or rather[118] the unity of substrate and privation.

This nothwithstanding, the parallel between non-substantial change and substantial change is suspicious on at least two grounds.

(1) The application of [c] to substantial change has been strongly criticised over the past decades. A numerous group of scholars has argued that substantial change amounts to a sheer substitution of substances, without anything persisting through change. I discuss the topic of persistence in §5.6, where I argue that Aristotle endorses [c] with relation to substantial change.

(2) A second problem is related to the kind of opposition selected as the relevant source of susbtantial change.

5.4.1. The source condition of substantial change between *Phys.I.5-7* and *Phys.V.1*.

In 2.1.1.2, I have claimed that Aristotle posits a necessary and sufficient conditions for the identification of the relevant sources of per se change:

> A and B qualify as sources of per se change, if they are maximally different, i.e. if they are contraries ($A/B=H^{+}/H^{-}$).

In §5.1.3.a, I have hinted at the fact that, in *Phys.I.7*, narrowing down the object of *Phys.I* to the principles *of substance* is parallel to the refinement of the concept of opposition in play with relation to change. In fact, the kind of opposition in play in non-substantial change is contrariety, whereas the kind of opposition in play in substantial change is the substantial opposition of form and privation.

In §2.2, I have shown that Aristotle addresses substantial opposites in a pre-technical way, namely not by way of explicitly thematising them as such. Aristotle's strategy in *Phys.I.5* is to argue that substantial change can be normalised as a change between contraries. In *Phys.I.7*, the transition from the contrariety entailed in non-substantial change to the substantial opposition of form and privation entailed in substantial change occurs smoothly and in absence of further

[118] Cf. *Phys.*, I.7, 190a13-b17 and the solution of the same aporia in *Phys.I.8*.

explanation. Nonetheless, it is quite clear that the pair of substantial opposites of form and privation do not fulfil the difference condition and are thus not on the same page with the contraries of *Phys.I.5*.

Other texts are more careful than *Phys.I* in articulating the difference between the sources of substantial change and those of non-substantial change. *Phys.V.1* is the most lucid recognition of this difference. The view endorsed by Aristotle in *Phys.V.1* is that the sources of substantial change (a kind of μεταβολή) are the contradictories, whereas the sources of non-substantial change (κίνησις) are the contraries. This is in plain contrast with the source condition elaborated in Arg.2 of *Phys.I.5*. For the sources of substantial change in *Phys.V.1* fulfil only the first, more general and weaker condition for natural change posited by *Phys.I.5* (i.e. the otherness condition), but fail to fulfil the second, narrower and stronger difference condition. According to the results of *Phys.I.5*, the sources of substantial change selected by *Phys.V.1*, the contradictories, fail to qualify as sources of change per se.

In what follows, I analyse the agenda and the main claims of *Phys.V.1*, in order to show that the individuation of the species of κίνησις (i.e. non-substantial change) within the genus of μεταβολή rests on the individuation of the relevant source of change proper to either kind of change. Namely, the contradictories A/¬A for μεταβολή and the contraries H^+/H^- (and their intermediates) for κίνησις.

Phys.V.1 opens (224a21-34) with a distinction between coincidental change and change ἁπλῶς, which is in turn subdivided into change with relation to the parts or with relation to the whole. The term ἁπλῶς is most likely to mean non-coincidental (or per se) instead of *simpliciter* (as elsewhere, e.g. *Phys.I.7* and *GC.I.3*). Moreover, the account of coincidental change is similar but not the same as that of *Phys.I.5*. Both accounts hinge on the notion of numerical coincidence or unity. Nonetheless, in *Phys.I.5*, the items that come to coincide numerically are the source of coincidental change A and the source of per se change H^+, so that A and H^- are sources of coincidental change, if H^+/H^- are sources of per se change, and if A coincides numerically with either H^+. In *Phys.V.1*, it is rather what undergoes change and an arbitrary feature of it that come to coincide. For instance, let what undergoes change be a man and the change per se the man undergoes be walking. Coincidental change occurs, if walking is attributed to an arbitrary feature

pertaining to man; for instance, if we say that the musical is walking, for musical is numerically one with the man that is walking per se.

224a34-b4 provides a list of the necessary conditions of change: the motor and the time in which something changes, and the three internal principles of change of *Phys.I*, namely what undergoes change (τὸ κινούμενον/τὸ ὅ) and the sources of change (τὸ ἐξ οὗ/τὸ εἰς ὅ). Then, Aristotle restricts the enquiry to the internal principles of change, namely to what undergoes change and to the sources of change, in order to argue for the first result of the chapter, namely that change is in neither of the sources of change, but rather in what undergoes change (224b4-8; b25-6). The end point of change, i.e. the form, instead, cannot qualify as what changes and is rather unmoved. If this were not the case, then the absurdum would result that the end point of a change would be a change.

The enquiry moves further (224b26ff.) to qualify the sources of per se change, for both coincidental change and per se change relative to the parts must be discarded.

> *Phys.*, V.1, 224b26-30
>
> ἡ μὲν οὖν κατὰ συμβεβηκὸς μεταβολὴ ἀφείσθω· ἐν ἅπασί τε γάρ ἐστι καὶ αἰεὶ καὶ πάντων· ἡ δὲ μὴ κατὰ συμβεβηκὸς οὐκ ἐν ἅπασιν, ἀλλ' ἐν τοῖς ἐναντίοις καὶ τοῖς μεταξὺ καὶ ἐν ἀντιφάσει· τούτου δὲ πίστις ἐκ τῆς ἐπαγωγῆς.
>
> And [the kind of] change that occurs coincidentally has to be left aside, for it is in all things and all the time and of all things. Instead, [the kind of change] that does not occur coincidentally is not in all things, but rather in the things that are contraries, intermediates [between contraries] or contradictories. And knowledge of this is provided by induction.

The result gained with relation to per se change in general (i.e. to μεταβολή in general, including κίνησις) is that the sources of per se change coincide with either the contradictories or the contraries (and their intermediates).

The following passage (224b35-225b9) represents the core of *Phys.V.1*, namely the distinction between μεταβολή and κίνησις. What is relevant to our purpose is that this difference is drawn the basis of their different sources of change. Namely, contradictories for μεταβολή and contraries for κίνησις.

The kinds of change μεταβολή and κίνησις are derived from the following a-priori consideration. Let us consider an affirmative term (F) and its contradictory or negation (¬F) as

sources of change.[119] Four possible relations between these terms are given, but only three of them qualify as relations of change, for every source of change is an opposite, and ¬F and ¬F are not reciprocally opposite.

It is clear that Aristotle endorses that μεταβολή is the genus of κίνησις, so that all κινήσεις are μεταβολαί, but not the other way round. Let us therefore start from the analysis of μεταβολή (225a12-34). There are two cases of μεταβολαί:

(1) ¬F → F

(2) F → ¬F,

where the first position is the starting point of change, the second position is the end point of change, and the arrow means "comes to be". Now, depending on the values of F in (1) and (2), two further kinds of μεταβολαί are given:

If F = substance, then the change occurring is a μεταβολή ἁπλή;

If F = non-substantial feature, then the change occurring is a μεταβολή τις.

Thus:

(1) ¬F → F:

a) F = substance, then: γένεσις ἁπλῶς (coming into being);
b) F = non-substance, then: γένεσις τις.

(2) F → ¬F:

a) F = substance, then: φθορά ἁπλῶς (ceasing to be);
b) F = non-substance, then: φθορά τις.

For instance, if we consider (1), we have coming into being, when a substance comes into being out of its previous non-being, whereas we have γένεσις τις, when, say, white comes to be out of non-white.

[119] Uncommonly, Aristotle employs the word ὑποκείμενον in order to qualify the sources of change. In 225a6-7, he clarifies "By ὑποκείμενον I mean that which is shown through affirmation". Thus, I believe that the pair ὑποκείμενον/μὴ ὑποκείμενον in *Phys.V.1* can be rephrased into F/¬F.

The third and final kind of μεταβολή is the κίνησις, which occurs between two positive features:

(3) F → F.

Now, this is obviously meant so signify:

(3*) $F^1 \rightarrow F^2$,

where F^1 and F^2 necessarily fulfil the otherness condition ($F^1 \neq F^2$), lest there be no change altogether occurring in the passage from F^1 to F^2.

Moreover, F^1 and F^2 must also fulfil the difference condition stated in *Phys.I.5* and qualify as contraries (H^+/H^-), as the following passage argues.

> *Phys.*, V.1, 225a34-b5
>
> ἐπεὶ δὲ πᾶσα κίνησις μεταβολή τις, μεταβολαὶ δὲ τρεῖς αἱ εἰρημέναι, τούτων δὲ αἱ κατὰ γένεσιν καὶ φθορὰν οὐ κινήσεις, αὗται δ' εἰσὶν αἱ κατ' ἀντίφασιν, ἀνάγκη τὴν ἐξ ὑποκειμένου εἰς ὑποκείμενον μεταβολὴν κίνησιν εἶναι μόνην. τὰ δ' ὑποκείμενα ἢ ἐναντία ἢ μεταξύ (καὶ γὰρ ἡ στέρησις κείσθω ἐναντίον), καὶ δηλοῦται καταφάσει, τὸ γυμνὸν καὶ νωδὸν καὶ μέλαν.
>
> And as every κίνησις is a certain μεταβολή, and as the [kinds of] μεταβολή are the aforesaid three ones, and as, among these, those according to coming into being and ceasing to be are not κινήσεις, [for] they are according to contradiction – it is necessary that only the μεταβολή [occurring] out of a ὑποκείμενον (F) into a ὑποκείμενον (F) is a κίνησις. And the ὑποκείμενα are either the contraries or their intermediates, for privation must be taken as a contrary, and naked, toothless and black are shown through affirmation.

The passage is a dense one and makes several points which are worth mentioning.

First, it is clear that the difference between pure μεταβολή and μεταβολή as κίνησις rests on their respective sources of change. If pure μεταβολή (i.e. substantial change: (1a) coming into being and (2a) ceasing to be) occurs between contradictory pairs, the sources of (3) κίνησις are rather the contraries or their intermediates. As the intermediates are reducible to the contraries, for these constitute the extremes through which the intermediates are defined, I will speak only of contraries. Thus:

(3**) κίνησις: $F^1 \rightarrow F^2$, where $F^1 = H^+$ and $F^2 = H^-$.

Moreover, privation is itself reduced to contrariety. Aristotle provides no rationale for this move, but it is clear that he feels the need to solve a difficulty, namely that privations appear to

be more similar to a negative term ⌐F than to a positive term F. If this were the case, the change whose sources includes one privations would be a pure μεταβολή and not a κίνησις. Aristotle claims instead that also privative features such as naked or black are affirmative features (i.e. are F). This argument is clearly insufficient to the scope of reducing all privations to contrariety.[120] Nonetheless, it is plausible that Aristotle is here interested in arguing only for the weaker claim that privations are not mere contradictories (and thus sources of pure μεταβολή), but rather affirmative terms, and thus sources of κίνησις.

Second, the relation between κίνησις and μεταβολή τις is unclear. To be sure, our text explicitly distinguish between κίνησις and (1a, 2a) μεταβολή *simpliciter* (coming into being and ceasing to be), but remains uncommitted with relation to (1b, 2b) μεταβολή τις. If κίνησις is a μεταβολή (for it is a species thereof), then H^+/H^- (e.g. white and black) can be spelled out in terms of contradictories (e.g. white and non-white). But change from white to non-white (or backwords) is (1b, 2b) a μεταβολή τις. I have claimed in §2.1. that the otherness condition and the difference condition are not only different in force, but also that the former is included in the latter, for H^+/H^- are $H^+/⌐H^+$, but not the other way round. In this connection, I believe that μεταβολή τις is a way of describing a per se κίνησις as a coincidental μεταβολή. In other words, I believe that there is one and only one phenomenon, namely H^+ undergoing κίνησις per se out of H^- (e.g. black coming to be white). Nonetheless, as H^+/H^- are by definition $H^+/⌐H^+$, it is always true to say that the κίνησις between H^+ and H^- is also a μεταβολή τις between H^+ and $⌐H^+$.

If this is true, what is the status of μεταβολή τις between H^+ and $⌐H^+$? Jacob Rosen has recently argued that it is a coincidental change.[121] Although I am sympathetic with the view that there is a proper kind of change (the κίνησις between H^+ and H^-) and that the μεταβολή τις is dependent on it, I believe that Rosen's interpretation meets two problems. First, kinds (1-3) of change are presented as non-coincidental ones (224b26-30). Second, $⌐H^+$ seems to be one with H^- not in a merely numerical way, but also with relation to form. If it is not necessarily true to say that musical holds of the man, it is instead necessarily true to say that $⌐H^+$ holds of every H^-. This consideration is consistent with the claim of *Phys.I.5* that the otherness condition is a necessary condition for A and B to qualify as sources of per se change, but not a sufficient one, for the

[120] As I have claimed, the converse seems to be rather true, namely that all contraries are reducible to the opposition *habitus*/privations (whereas not all *habiti*/privations are contraries).
[121] Rosen 2016.

sufficient condition prescribes that A and B are reciprocally different, i.e. contrary. On the basis of these considerations, I believe that μεταβολή τις is a description of per se κίνησις with relation to the otherness condition only, namely with relation to the more general, merely necessary source condition. Thus, μεταβολή τις is a not merely coincidental, but rather a non-coincidental, merely necessary and non-sufficient description of per se κίνησις, for it considers the sources of κίνησις only with relation to the otherness condition.

In conclusion, *Phys.V.1* endorses the following picture with relation to the sources (A and B) of substantial change and non-substantial change:

> Substantial change ((1a), (2a): γένεσις/φθορά ἁπλῶς): A/B = F/⁻F (contradictories); and F = substance;
>
> Non-substantial change (3: κίνησις): A/B = H^+/H^- (contraries) or *habitus*/privation of H; and H = non-substantial feature (quality, quantity or place).[122]

Phys.I, instead, provides the following picture:

> Substantial change: A/B = (substantial) form/privation;
>
> Non-substantial change: A/B = contraries.

As an overview, for each kind of change, in *Phys.I* and *Phys.V.1*, A/B are:

	Phys.I	***Phys.V.1***
Substantial change	Substantial forms/privations	Contradictories
Non-substantial change	Contraries	Contraries; Non-substantial *habiti*/privations

As a further step, let us analyse the claims on the sources of substantial and non-substantial change in of *Phys.V.1* through the lense of the source condition as it is spelled out in Arg.2 of *Phys.I.5*.

[122] *Phys.V.2* expands on κίνησις and argues *ad absurdum* that no κίνησις is given in non-substantial categories other than quality, quantity and place.

With relation to the otherness condition (i.e. A/B = F/⁻F) for A/B to qualify as sources of per se change, *Phys.I* and *Phys.V.1* disagree to this extent:

	Phys.I	***Phys.V.1***
Substantial change	Only necessary[123]	Sufficient
Non-substantial change	Only necessary	Only necessary

As both *Phys.I* and *Phys.V.1* entrust non-substantial change to a kind of opposition that is narrower than contradiction, they must agree that the otherness condition cannot be sufficient. The same view seems to be endorsed by *Phys.I* with relation to substantial change, for it rests on sources of change that are opposed to each other not only as contradictories, but also as form and privation. *Phys.V.1*, unlike *Phys.I*, rather endorses that the otherness condition must be sufficient for A and B to qualify as sources of per se substantial change.

The difference condition (i.e. A/B = H^+/H^-), instead, seems to apply in the following way:

	Phys.I	***Phys.V.1***
Substantial change	Not fulfilled	Not fulfilled
Non-substantial change	Sufficient	Sufficient (at least in some cases)

Let us start from *Phys.V.1*. With relation to non-substantial change (κίνησις), the difference condition is fulfilled to the extent to which the opposition of *habitus*/privation can be reduced to contrariety. As I have claimed, this reduction does not seem to be Aristotle's concern in *Phys.V.1*. The difference condition seems to apply at least to the cases of non-substantial change that do not involve the opposition of *habitus*/privation. Substantial change, instead, as it involves the most general opposition of contradiction, rests to no extent on the difference condition.

Phys.I, as *Phys.V.1* (at least partially) does, endorses that the difference condition is sufficient with relation to non-substantial change. The case of substantial change in *Phys.I* is, as I said, a tricky one. Aristotle's attempt to bridge the passage from non-substantial to substantial change in *Phys.I.5* is pre-technical and tentative. As it precedes the distinction between substantial and non-substantial change drawn in *Phys.I.7*, we cannot expect the attempt of *Phys.I.5* to be

[123] For all forms/privations are contradictory, but not all contradictories are forms/privations.

conclusive. *Phys.I.7*, however, in implicitly recognising that substantial change must rest on a different kind of opposition than that of contrariety, draws a neat distinction between substantial and non-substantial change with relation to their respective sources. Thus, Aristotle's final answer on the sources of substantial change in *Phys.I* cannot be that the difference condition is sufficient. For neither does substantial change rest on contrariety nor does the opposition of form and privation identify with contrariety.

If *Phys.I* posits something such as a sufficient source condition for substantial change, it can neither be as broad as the otherness condition endorsed in *Phys.V.1* as sufficient (for form/privation do not coincide with the contradictories) nor as narrow as the difference condition (for form/privation are not contraries, although all contraries are forms/privations).

Less introductory and more in-depth treatments of change than *Phys.I*'s bring in the conceptual tool of potentiality in order to account for the identity of the relevant sources of substantial change. As I have claimed, the concept of potentiality is absent from the main elaboration of *Phys.I* and appears only pre-technically in the last chapter of the text. If this is true, as I believe it is, then invoking the concept of potentiality in order to account for the relevant sources of substantial change is not a viable strategy. Gill's reading of *Phys.I.7*, although the problem she tackles is different from the one I tackle here, may provide a solution in this spirit.[124] According to Gill, the example of the man coming to be musical provided in our text is not a casual one, but is rather a particular kind of change in which a substrate changes with relation to what is proper to it (for musical seems to be proper to the man alone). In Gill's view, changing with relation to what is proper to the substrate means changing with relation to a determinate potentiality or capacity of the substrate. For instance, the relevant sources of change selected in *Phys.I.7* are those that possess a determinate capacity that is proper to a determinate substrate. In other words, a certain substrate that is endowed with a capacity for F changes, if it is F only potentially at t^1 and actualises F at t^2.

Although I do not contest that Gill's picture is genuinely Aristotelian, I do not think that it is developed in *Phys.I*. If we consider the *Physics* alone, the tool of natural potentiality or capacity belongs to a more advanced explanation of nature than the one pursued in *Phys.I*, namely where

[124] Gill 1989, 98ff.

the doctrine of the four causes is introduced and teleology is in play. This upgrade of the science of nature is foreshadowed in *Phys.I.9*, where Aristotle tackles and refutes the Platonic identification of the substrate with opposition (i.e. with the Great and the Small). One of the main difficulties of Plato's doctrine of the substrate is that it is inconsistence with the idea that the substrate has an innate tension to the form. The idea that the substrate is something with an innate tension and potentiality for something else is fleshed out in *Phys.II*, where the doctrine of the four causes and teleology are introduced. In paradigmatic cases, the substrate, or the matter, is something that has tension to a certain form that represents its intrinsic end, for the realisation of the form is the actualisation of the determinate potentiality of the matter. Having introduced a complete causal explanation and the concept of potentiality, it is open for *Phys.III* to qualify change as the passage from being potentially F to being actually F occurring in a certain substrate.

Gill's reading of *Phys.I.7* along the pattern of natural potentiality is exposed, I believe, to the danger of importing a conceptual machinery that is not present in *Phys.I*. I believe that, as the answer to the question whether matter or form be substance and primary, the rationale for positing form and privation as the relevant sources of substantial change is not provided in *Phys.I*. Both these issues require in fact an upgraded explanation of nature, and one that is both causally complete and dynamic. In fact, there is some reason for believing that the accomplishment of the potentiality of something, which is also the fulfilment of its intrinsic end, qualifies as substance to the highest extent. Likewise, the relevant sources of change cannot be selected only horizontally, namely with regard to the relation binding the sources to each other. Rather, it is reasonable that the rationale for the sources of change to be such and such is a vertical one. Namely, that it regards the relation between the substrate that undergoes change and the sources. Form (and the privation thereof) is the relevant source of substantial change, for it is the end to which the substrate that is the starting point of substantial change tends, and because its actualisation is the actualisation of the intrinsic potentiality of this substrate.

Thus, differently from the horizontal opposition of contrariety in play in non-substantial change, the opposition of form/privation that constitutes the sources of substantial change is intrinsically a vertical one and is incomplete in absence of a reference to the potentiality of the substrate. Nonetheless, the vertical relation between substrate and form/privation, as well as the dynamic

and teleological perspective of a complete study of nature are absent from *Phys.I*, or at best just foreshadowed in *Phys.I.9*.

The most plausible way to harmonise *Phys.I* and *Phys.V.1* with relation to the sources of change is, I believe, to endorse that the contradictories selected in *Phys.V.1* as sources of substantial change are not any contradictories whatsoever, but rather the contradictories that are proper to a certain substrate. In the *Corpus*, the pair of form and privation is consistently referred to as the contradictories in the substrate. This can be plausibly taken to mean that the opposites form/privation neither coincide with the contradictories F/⌐F nor with the contraries H^+/H^- (i.e. with two particular contradictories belonging to the same genus, where $H^- \supset \neg H^+$, and $H^+/H^- \supset$ one genus). Rather the items qualifying as forms and privations of these forms (F^+/F^-) are a particular pair of contradictories F/⌐F enjoying a certain relevant relation with a certain substrate S. This relation is codified by the positive opposite F and is such that it F is proper to S in the sense that S has a natural capacity C for F (C(F)). Form and privation are the presence or absence of F in a S that has C(F). Thus, form and privation are the contradictories F/⌐F, when F necessarily belongs to a certain S that is endowed with C(F).

Let us consider a typical example of the opposition of *habitus* and privation, namely having sight and being blind. Unlike the contradictory pair of having sight and not having sight, the scope of having sight/being blind is confined to the set of substrates S that are endowed with the capacity for sight. For, a substrate lacking the capacity for sight may either have or not have sight, but cannot be blind. In order to be blind, a substrate must either possess the capacity for sight as an individuum, and have lost it (e.g. Oedipus), or possess the capacity for sight with relation to its species or genus, but fail to realise it (e.g. someone who is congenitally blind).[125] Thus, the scope of the contradictory pair of having sight/not having sight is unlimited, for every substrate is either one or the other. The scope of form/privation (F^+/F^-), instead, is confined to a certain subset of substrates, namely to those that are endowed with the capacity for F^+ ($C(F^+)$). With relation to the broad set of all substrate S, F^+/F^- are incompossible, but not by necessity disjunctively true as the contradictories F/⌐F. With relation to S*, namely to the set of the substrates that are endowed with $C(F^+)$, F^+/F^-, instead, behave as contradictories, for, with relation to S having $C(F^+)$, F^+/F^- are incompossible and by necessity disjunctively true. Let us

[125] *Metaph.*, V.22, 1022b22-7.

consider again the previous example: in any given time t, each and every animal that can exercise the sense of sight is necessarily either endowed with sight or blind, but not both endowed with sight and blind. In this connection, the opposition of form and privation can be said to be a contradiction proper to a certain substrate. In conclusion, with relation to the proper set of substrates S*, form/privation are contradictories.

If we endorse that the contradictory pair F/⌐F that is said to be the relevant sources of substantial change in *Phys.V.1* is the contradiction that is proper to a certain set of substrates and not to any substrate; namely, that F/⌐F are the relevant sources of the substantial change for a substrate S* that is endowed with C(F); then, the discrepancy between *Phys.V.1* and *Phys.I* is reconciled.

Let us assume that this hypothesis is true and go back to the otherness condition with relation to substantial change. I have claimed that, at face value, the otherness condition seems to behave in the following way:

	Phys.I	***Phys.V.1***
Substantial change	Only necessary	Sufficient

If, in order to be harmonised with *Phys.I.5*, *Phys.V.1* is understood to claim that F/⌐F are sources of substantial change of S *only on the proviso* that S is endowed with C(F), then it is evident that the previous claim is false, and that both in *Phys.I* and *Phys.V.1* the otherness condition is only necessary. For, a further and more specific condition is needed. Namely, are sources of substantial change (otherness condition), if(f)

capacity condition: S is endowed with C(F).

I remain uncommitted whether the capacity condition be sufficient or only necessary. What is relevant is that its addition makes the otherness condition only necessary, thus correcting the previous impression and dispelling the apparent inconsistency between *Phys.V.1* and *Phys.I.5*. Rather, *Phys.I* and *Phys.V.1* convene in stating that the otherness condition is only necessary.

	Phys.I	***Phys.V.1***
Substantial change	Only necessary	Only necessary

5.4.2. The analogy between contraries and substantial opposites (form/privation).

The enquiry of the previous section has shown that Aristotle endorses in *Phys.V.1* a certain degree of difference between the sources of non-substantial change (the contraries) and the sources of substantial change (the contradictories fulfilling the capacity condition).

In the present section, I argue that *Phys.I* does not endorse a homogeneous account of the sources of substantial and non-substantial principle. Rather, Aristotle endorses that there is a certain analogy between the sources of non-substantial change (the contraries) occupying the stretch of text from *Phys.I.4* to *Phys.*, I.7, 190a31 and the opposition of form/privation qualifying as sources of substantial change according to the second part of *Phys.I.7*.

Contraries and substantial opposites (form/privation) are not identical. Nonetheless, there is a certain sort of analogy between the sources of non-substantial change and those of substantial change, amounting to the facts that: (a) the sources of change must be exclusive opposites (i.e. either contradictories or substantial opposites or contraries); (b) but the otherness condition is necessary and non-sufficient (thus excluding contradictories from the range of the sources of change).

In §2.2, I have shown that *Phys.I.5* (188b8-23) tackles the issue of the difference between the sources of substantial change and the sources of non-substantial change in a pre-technical way. The strategy of the passage consists in showing that opposite couples such as formedness/formlessness; being-composite/being-scattered are sources of change just as other contraries are. Two issues are left to the vagueness of a pre-technical treatment. First, the opposite couples mentioned are not explicitly ranked as cases of substantial opposites; rather, form and privation are introduced explicitly only once the difference between substantial and non-substantial change is drawn. Second, it is unclear whether Aristotle means to endorse a perfect identity between substantial opposites and contraries, or rather an analogy. Although the letter of the text may seem to support the stronger reading, I have dispelled it as theoretically suspicious (for it entails that privations are determinate items) and opted for the analogical reading.

The analogy between the members of opposite couples is in play in at least two passages of *Phys.I*.

First, *Phys.I.5* (188b26-189a10, cf. §2.4.) clarifies that each member of a contrary couple is either positive or negative. Thus, two columns (συστοιχίαι) of contrary terms are created according to their reciprocal analogical relation:

H^+	**H^-**
Hot	Cold
Dry	Moist
Even	Odd

The same principle is in play in *Phys.I.6* (189b8-11, cf. §4.2.2.2.),[126] where Aristotle reduces the two aforesaid columns of contraries to the categories of excess and defect (ὑπεροχή/ἔλλειψις). Excess and defect are the closest Aristotle gets to anticipating form and privation in a pre-technical context. Although they have a quantitative flavour, they spell out contrariety as the relation of having (much of) a certain F and lacking F. A similar conceptual move can be found in *Metaph.X.4*,[127] where the relation of contrariety is spelled out into the relation of *habitus*/perfect privation (i.e. lacking the habitus completely). Aristotle, however, makes clear that the opposition of form and privation cannot be reduced to that of contrariety, whereas the converse is the case. Thus, excess and defect, namely the pre-theoretical placeholders for the substantial opposition of form and privation, do not qualify as genera of the columns of contraries H^+/H^-. Rather:

H^+: H^- (contrariety) = excess: defect (substantial opposition: form/privation).

In conclusion, I have claimed that the passage from the sources of non-substantial change (*Phys.I.4* to *Phys.*, I.7, 190a31) to the source of substantial change (*Phys.*, I.7, 190a31ff.) is guided by analogy rather than by complete homogeneity.

[126] ἀλλὰ πάντες γε τὸ ἓν τοῦτο τοῖς ἐναντίοις σχηματίζουσιν, πυκνότητι καὶ μανότητι καὶ τῷ μᾶλλον καὶ ἧττον. ταῦτα δ' ἐστὶν ὅλως ὑπεροχὴ δηλονότι καὶ ἔλλειψις, ὥσπερ εἴρηται πρότερον. "But all of them shaped the one by means of the contraries – by means of density and rarity, of the more and the less; and these are namely, in general, excess and defect, as I have claimed before."
[127] Cf. §4.1 and §4.2.1.

5.5. The analysis of the starting point of substantial change.

After having argued for the κοινά of change [a-c], Aristotle narrows down the scope of his investigation to the principles of substantial change, analysing first (190b1-17) its starting point, and then (190b17-29) its end point.

Scope of the analysis appears to be to argue that the κοινά of change [a-c] extend to the special case of substantial change. Nonetheless, Aristotle's intention to claim [c[1]] that the substrate persists through substantial change has been widely criticised; discussion will be delayed to §5.6. In the following two sections, I show that [a-b] hold with relation to substantial change.

5.5.1. There is a substrate underlying every substantial change as its starting point ([a]).

Phys., I.7, 190a31-b9

πολλαχῶς δὲ λεγομένου τοῦ γίγνεσθαι, καὶ τῶν μὲν οὐ γίγνεσθαι ἀλλὰ τόδε τι γίγνεσθαι, ἁπλῶς δὲ γίγνεσθαι τῶν οὐσιῶν μόνον, κατὰ μὲν τἆλλα φανερὸν ὅτι ἀνάγκη ὑποκεῖσθαί τι τὸ γιγνόμενον (καὶ γὰρ ποσὸν καὶ ποιὸν καὶ πρὸς ἕτερον [καὶ ποτὲ] καὶ ποὺ γίγνεται ὑποκειμένου τινὸς διὰ τὸ μόνην τὴν οὐσίαν μηθενὸς κατ' ἄλλου λέγεσθαι ὑποκειμένου, τὰ δ' ἄλλα πάντα κατὰ τῆς οὐσίας)·

[a] ὅτι δὲ καὶ αἱ οὐσίαι καὶ ὅσα [ἄλλα] ἁπλῶς ὄντα ἐξ ὑποκειμένου τινὸς γίγνεται, ἐπισκοποῦντι γένοιτο ἂν φανερόν. ἀεὶ γὰρ ἔστι ὃ ὑπόκειται, ἐξ οὗ τὸ γιγνόμενον, οἷον τὰ φυτὰ καὶ τὰ ζῷα ἐκ σπέρματος.

γίγνεται δὲ τὰ γιγνόμενα ἁπλῶς τὰ μὲν μετασχηματίσει, οἷον ἀνδριάς, τὰ δὲ προσθέσει, οἷον τὰ αὐξανόμενα, τὰ δ' ἀφαιρέσει, οἷον ἐκ τοῦ λίθου ὁ Ἑρμῆς, τὰ δὲ συνθέσει, οἷον οἰκία, τὰ δ' ἀλλοιώσει, οἷον τὰ τρεπόμενα κατὰ τὴν ὕλην. πάντα δὲ τὰ οὕτω γιγνόμενα φανερὸν ὅτι ἐξ ὑποκειμένων γίγνεται.

And coming to be is said in many ways. And out of these, on the one hand, [things] not [only] come to be, but come to be this; on the other hand, [things] come to be simply, and this is proper to substances only. And with relation to the others [to what is not a substance], it is evident that something must necessarily underlie [ὑποκεῖσθαι], i.e. what-comes-to-be [τι τὸ γιγνόμενον]. For quantity, quality, relation, [time,] and place come to be on condition that there is a certain substrate, because it is only substance that is not said of any other substrate, whereas the others [what is not substance] are all said of substance.

[a] And that also substances, i.e. those things which exist simply, come into being [γίγνεται] out of a certain substrate, will become evident through attentive examination. For there is always something underlying [ὃ ὑπόκειται], i.e. the what-comes-into-being [τὸ γιγνόμενον] out of which [something comes into being] [or: For there is always

> something underlying out of which what comes into being [comes into being]], as for example plants and animals [come into being] out of the seed.
>
> What comes to be simply [τὰ γιγνόμενα ἁπλῶς] comes into being [γίγνεται] through a change of figure (e.g. the statue), through addition (e.g. the things that grow), through subtraction (e.g. the Hermes out of the stone), through composition (e.g. the house), through qualitative change (e.g. the things that change with relation to their matter). And it is evident that all the things that come to be in this way [i.e. that come into being] come into being [γίγνεται] out of substrates.

This passage presents the analysis of the starting point of substantial change, i.e. the analysis of what-comes-into-being.

The claim that [a] there is a substrate underlying substantial change as a starting point is less evident than in the case of coming to be, where its necessity is revealed by an argument hinging on coincidental metaphysical predication. Here, the metaphysical dependence of non-substantial predicates on the substances they are predicated of entails that there must be a substance underlying what undergoes non-substantial change as a substrate. The same argument cannot hold for substances, for substances are metaphysically independent of non-substances. Rather, the argument rests on induction. Aristotle examines a collection of cases of substantial change, and shows that in each of them, [a] holds.

Extending [a] to (natural) substances presents at least two difficulties. The first one concerns the being of natural things; the second one their changeability.

(1) The argument stretching from *Phys.I.5* to *Phys.*, I.7, 190b1 accounts for natural reality from the perspective of coincidental metaphysical predication in play in *Cat. 5*. According to it, the analysis of reality stops at the level of what the *Categories* call primary substance, i.e. the bearer of properties (non-substances).

The upshot of the analysis started in *Phys.*, I.7, 190b1 is that natural substances are not the simplest layer of reality. Rather, the primary substances that are substrates of properties are in turn composed out of a substrate, i.e. matter, and of either the form informing it or the lack thereof (privation). Matter functions as the bearer of either form or privation (mF^{+}; mF^{-}), as primary substances are the bearers of properties in coincidental compounds such as the musical man. Only, not quite in the same way.

When metaphysical analysis of natural reality is brought a step further and applied to substance, the territory is uncharted and the dependence relations holding in the previous case do not seem to apply. Endorsing a dependence relation in play in coincidental metaphysical predication, where this is understood existentially, would lead to the absurdum of a formless, indeterminate primary matter. Thus, the relation of substantial predication, i.e. the relation between matter and form/privation, appears to distance itself from the relation of coincidental metaphysical predication in play from *Phys.I.5* to *Phys.*, I.7, 190b1, and requires further clarification.

(2) We commonly describe processes of (non-substantial) coming to be according to the conceptual/linguistic pattern "x comes to be *(out of) y*". (Substantial) coming into being is, unlike the previous case, simple (ἁπλῶς). The qualification "simple" concerns, on the one hand, the ontological status of what comes into being, namely of substances, as the only beings that exist simply, i.e. independently of other beings. On the other hand, it regards the peculiar way of conceptualising coming into being according to the pattern "x comes into being", which makes no reference to anything other than the substance resulting from the process of coming into being. One of the tasks of *Phys.I.7* is to show that the model "x comes into being" proper to substantial change must be spelled out into the general model of coming to be "x comes to be *(out of) y*", according to which the starting point y is a compound of substrate and privation, whereas the end point x is a compound of substrate and form.

In conclusion, the necessity of a substrate underlying coming into being is not evident and requires being argued for.

5.5.2. The starting point of substantial change as a composite nature ([b]).

> *Phys.*, I.7, 190b10-17
>
> [1] ὥστε δῆλον ἐκ τῶν εἰρημένων ὅτι τὸ γιγνόμενον ἅπαν ἀεὶ συνθετόν ἐστι, καὶ ἔστι μέν τι γιγνόμενον, ἔστι δέ τι ὃ τοῦτο γίγνεται, [2] καὶ τοῦτο διττόν· ἢ γὰρ τὸ ὑποκείμενον ἢ τὸ ἀντικείμενον. [3] λέγω δὲ ἀντικεῖσθαι μὲν τὸ ἄμουσον, ὑποκεῖσθαι δὲ τὸν ἄνθρωπον, καὶ [4] τὴν μὲν ἀσχημοσύνην καὶ τὴν ἀμορφίαν καὶ τὴν ἀταξίαν τὸ ἀντικείμενον, τὸν δὲ χαλκὸν ἢ τὸν λίθον ἢ τὸν χρυσὸν τὸ ὑποκείμενον.
>
> [1] Therefore, it is clear from what has been said that all what comes to be [τὸ γιγνόμενον] is always composite. And this is, on the one hand, this-that-comes-to-be [τι γιγνόμενον]; on the other hand, this-that-something-has-come-to-be [τι ὃ τοῦτο γίγνεται].

> [2] And this [this-that-comes-to-be] is twofold, for it is both the substrate and the opposite. [3] And we say that the unmusical is what is opposite; the man is what underlies [ὑποκεῖσθαι]. [4] And figurelessness, formlessness and disarrangement are the opposite; bronze, stone and gold are the substrate.

Having assessed that [a] applies to substantial change by virtue of induction from a collection of cases, Aristotle proceeds in [2] to secure the same result with relation to [b]. The starting point of all changes is said to be composed out of a substrate and an opposite. First ([3]), the claim is exemplified with relation to non-substantial change. In the case of a man coming to be musical, the relevant starting point of this change is, on the one hand, the man and, on the other hand, the unmusical. Finally ([4]), [b] is shown with relation to substantial change, by way of taking up a paradigmatic case out of the ones collected previously, the cases of the statue. Be it the product of moulding bronze or gold, or of carving a block of stone, the statue comes into being, on the one hand, out of the abovementioned matters and, on the other hand, out of the privation of figure, form or arrangedness constituting the form of the statue.

In conclusion, the analysis of the paradigmatic example of the statue shows, according to Aristotle, that [b] the starting point of substantial change is twofold. Spelling out the claim according to the conceptual distinctions previously introduced, the starting point of substantial change (mF^-) is the numerical unity of two items that are different by account. If one does not disentangle numerical unity from unity by account, one may claim, for example, that the statue comes into being out of the gold, or out of the figureless, thus overlooking the other starting point of substantial change. The truth is rather that matter and privation constitute a numerical unity, for privation comes to coincide with its bearer, matter. Nonetheless, matter and privation are different in account.

Once [b] has been proved with relation to the starting point of substantial change, and thus with relation to all per se change (for [b] has been already proved to hold of non-substantial change), it remains to argue that it holds also of the end point of substantial change. In [1], the distinction between starting point and end point of change (cf. §5.2.1.) is repeated in slightly varied formulas (τι γιγνόμενον for the previous τὸ γιγνόμενον; τι ὃ τοῦτο γίγνεται for the previous ὃ γίγνεται).[128] If [2,4] argue for [b] with relation to the starting point of substantial change, the next

[128] Although, for the sake of brevity, I traslated τοῦτο in the second formula as "something", I assume that it picks the previous τι γιγνόμενον. The main variation on the previous formulas, consisting in the addition of τι, is, I believe, of little or no importance. The main focus of the section is, admittedly, substantial change. In this context, τι

passage (*Phys.*, I.7, 190b17ff.) argues for [b] with relation to the end point of substantial change. I analyse the passage in the next section.

5.6. The persistence of the substrate through substantial change ([c]).

Phys.I.7 seems to claim for [c] as a character of change in general. When something changes,

[c^1] the substrate persists; [c^2] the contrary and the opposite do not persist.

The claim [c^1] that the substrate persists through substantial change has become highly controversial over the past decades. The debate is more nuanced than I can portray here, and is, at least to some extent, twined with the debate concerning prime matter. In fact, according to the long-standing traditional interpretation, the generation of a new substance (S^2) out of a previous substance (S^1) always entails the persistence of prime matter as a pure capacity underlying both S^1 and S^2.[129]

The traditional interpretation has been rejected altogether by a vast front of scholars from the Seventies of the last century. The anti-traditional view has been initiated, to my knowledge, by Charlton and has been advocated most convincingly by Barrington Jones and Sarah Broadie.[130] The anti-traditional view denies that there is anything persisting through substantial change, let alone prime matter. Thus, whenever a new substance S^2 comes into being out of the corruption of a pre-existing substance S^1, what occurs is a sheer replacement of S^1 with S^2.

An intermediate position is the one held by scholars who admit the persistence of the substrate through substantial change, but identify it with the four elements rather than with prime matter.[131]

The scepticism against [c^1] rests on three arguments.

First, the gist of the controversy is an obvious difficulty posed by complex cases of generation such as the generation of organisms. Abstracting from exegetical problems and difficulties, it

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might highlight the substantiality of the starting point and end point of change. Nonetheless, the passage seems to be concerned with all comings to be (τὸ γιγνόμενον ἅπαν), and [3] refers to non-substantial change.

[129] Digging out the entirety of this tradition and displaying its internal complexity is a task that I will not pursue here. For standard expositions of the traditional interpretative line: Joachim 1922, pp.92-3, 96-7; Robin 1944, 73-80.

[130] Charlton 1992 (1970), Jones 1974, Broadie 2004.

[131] King 1956, Gill 1989.

seems evident that the substance out of which a human being comes into being, e.g. the menses, is not the matter of the substance that has come into being, e.g. the human being. The thin conceptual import of the anti-traditionalist view and the fact that it solves the obvious (not to say naive) difficulty posed by complex cases of substantial change have contributed to make the anti-traditionalist view into the new commonplace.

Second, Aristotle appears to endorse in other texts that coming to be and coming into being diverge with relation to the persistence of the substrate. For instance, *GC.I.3-4* may seem to claim that substantial change occurs, when the substrate existing at t^1 is substituted by a new substrate at t^2.

Third, *Phys.I.7* presents a complex situation. On the one hand, [c^1] is included among the characters of change in general ([a-c]) and is thus supposed to hold of substantial change as well. On the other hand, the κοινά of change are derived from the analysis of non-substantial change and have therefore a two-faced status. They both are supposed to apply to substantial change and are exposed to the suspicion of pertaining to non-substantial change alone. Moreover, if [a-b] are explicitly argued for with relation to substantial change, [c] is not.

I believe that [c^1] holds for several reasons.

First, *GC.I.3-4* can be – and, I believe, should be – interpreted in a persistence-compatible way. I do not fully pursue this task here, but I confine myself to point out that *GC.I.4* distinguished between the case of non-substantial change, in which the substrate persists identical to itself, from the case of substantial change. When a substrate S^1 changes into a substance S^2, then two requirements must be fulfilled: [1] that S^1 changes completely (i.e. ceasing to be as S^1: otherness condition, cf. §2.1.1.1.); [2] that nothing perceptible (or nothing that is perceived (as S^1)) persists.[132] [1] does not rule [c] out, and [2] can be interpreted in a persistence-friendly way, either as leaving space for the possibility that something non-perceptible persists or (according to the alternative translation proposed) as re-echoing [1].

[132] *GC*, I.4, 319b17-20: Ὅταν δ' [1] ὅλον μεταβάλλῃ [2] μὴ ὑπομένοντος αἰσθητοῦ τινὸς ὡς ὑποκειμένου τοῦ αὐτοῦ, ἀλλ' οἷον ἐκ τῆς γονῆς αἷμα πάσης ἢ ἐξ ὕδατος ἀὴρ ἢ ἐξ ἀέρος παντὸς ὕδωρ, γένεσις ἤδη τὸ τοιοῦτον, τοῦ δὲ φθορά […]. (Text: Rashed 2006) When, instead, [something] changes [1] entirely [2] without there being anything perceptible that persists as a substrate of it (as when from all the seed [comes to be] the blood, or when from water [comes to be] air, or when from all the air [comes to be] water), then such [a change] is coming to be, whereas the other is ceasing to be […].

Second, the method of *Phys.I*, I have claimed, consists in starting from what is common, in order to reach what is proper to the single cases. Programmatically, the analysis of the starting point of coming to be (cf. §5.3.) presents what is common to change in general, whereas our passage analyses the peculiarities of coming into being. What we expect our passage to do against this methodological background is to extend [a-c] to substantial change.

Third, if Aristotle omits to argue for [c] with relation to substantial change (although he argues for [a-b]), he selects most of the cases of coming into being among those that most evidently fulfil [c^1]. Thus, it appears that Aristotle wants to show the truth of [c] by induction.

Fourth, substantial change is consistently qualified through the *Corpus* as that change in which a substrate is characterised by a privation at t^1, and by a form at t^2. To be sure, this picture does not exclude that a certain degree of change in the one substrate may take place from t^1 to t^2, provided that the substrate at t^1 is preserved in the substrate at t^2.

In what follows, I make conceptual space for this possibility, in order to explain away the complex cases of substantial change in which it is not immediately evident that [c^1] holds. I first introduce two conceptual distinctions in order to qualify what kind of matter can be said to persist through substantial change, and in what sense persistence should be understood. Finally, I show that every instance of substantial change analysed in *Phys.I.7* confirms [c^1], and in which sense.

Let us consider the diachronic structure of substantial change presented in *Phys.*, I.7, 190a31-b9 (cf. §5.5.1.) Aristotle's argumentative aim in our passage is assessing [a-b]. [c] is more an aside Aristotle is not directly concerned with.

Nonetheless, by considering the instances of starting points and end points of substantial change collected in our passage, I argue that Aristotle mostly chooses examples (numbers 2-6) in which [c^1] is evident. Example 1 is in need of explanation, but can be shown to fulfil [c^1], provided that some conceptual distinctions are made. In the table below, I gather the material collected in our passage and supply the missing information.

S^1 (starting point)	→	**S^2 (end point)**	**Through (dative):**
1. σπέρμα	→	Plants and animals	--
2. Lump of gold	→	Statue	Change of figure
3. Block of stone	→	Statue of Hermes	Subtraction
4. Substantial parts (twigs)	→	Substantial whole (bundle)	Addition
5. Bricks, planks, cement…	→	House	Composition
6. Graphite	→	Diamond	Alteration (of matter)

TAB.1

5.6.1. Defining persistence.

Trivially, persistence is a diachronic concept. Let us consider two substances S^1 and S^2 occupying, respectively, two points in time t^1 and t^2 (where $t^1<t^2$). Every substance coming into being does so out of a pre-existent substance ceasing to be, and S^1 and S^2 are, respectively, the starting point and the end point of substantial change. Broadly, we say that S^1 persists through substantial change, if, in some sense, it is at t^2.

In §5.5.2, I have assessed that S^1 [b] is a composite source of change. The same will be shown to hold with relation to the end point of substantial change (cf. §5.7.2.) In short: $S^1=MF^-$ and $S^2=MF^+$. Thus, [c^1] must be spelled out with relation to the elements of S^1/S^2. In particular, it must be assessed whether the same matter M persists in the process of losing the privation F^- and acquiring the form F^+. Asking this question implies to admit the possibility that M may not be the same; therefore, I reformulate the previous of analysis of the sources of change into: $S^1=M^1F^-$ and $S^2=M^2F^+$, and ask whether $M^1=M^2$.

I have claimed in §5.2.3. that this condition can be spelled out in (at least) two ways. Thus, in the case in which S^2 comes into being, i.e. in the case in which M^1F^- changes into M^2F^+, assessing [c^1] depends on assessing whether or not:

existential condition (weaker): M^1 still exists in S^2, i.e. M^1 still exists in M^2. Or:

identity condition (stronger): M^1 is still the same M^1 in S^2, i.e. M^1 is identical with M^2.

The identity condition is stronger, because it entails also the existential condition, as well as the requirement that the matter persists unchanged. The existential condition allows for M^1 to persist by way of changing into M^2. Existential persistence, thus, admits of the following scenario:

M^1 is not identical with M^2 (for[133] $M^1<M^2$); nonetheless,

M^2 is a complex matter, which includes M^1 as a material part.

In my analysis of *Phys.I.7*, I show that the examples of substantial change provided by Aristotle fulfil either the stronger or the weaker condition for persistence. The majority of the cases of substantial change is shown to fulfil the stronger identity condition. The more complex case of the coming into being of organisms requires separate treatment. As the scope of my analysis is to lay out the ultimate structure of natural reality, I will not deal with the details of Aristotle's embryology. My scope will be to show that, given a broad picture of the process of coming into being of an organism such as man, there is at least one sense according to which the substrate persists through substantial change, for the weaker existential condition is fulfilled.

5.6.2. Diachronic and synchronic matter.

I have claimed that there are two senses in which matter (and the opposites) are principles of natural things.

In the first sense, matter is a principle of natural beings with relation to (substantial) change, for it is that out of which natural things (S^2) come into being. I label the matter that functions as a principle of change *diachronic matter*, in order to pinpoint the fact that it is involved in a process of change involving time. If we consider case [1] in the table above, the diachronic matter at t^1 out of which S^2 (the plant) has come into being at t^2 is the seed.

In the second sense, matter is a principle of natural things with relation to their being or substantial composition, for it is that out of which natural things (S^2) are composed. I label the matter that functions as a principle of being *synchronic matter*, in order to pinpoint the fact that it is the matter constituting either the starting point of change or the end point of change, in

[133] I use the symbol < as meaning "is less complex than".

abstraction from the process of change in which they are involved.[134] Let us consider case [1] in the table above. If S^2 is the plant, the synchronic matter out of which S^2 is ontologically constituted (SM^2) most plausibly coincides its material parts, such as the trunk, the leaves and the roots. If S^1 is the seed, namely a kind of matter that is quite low in the scale of complexity, its synchronic matter (SM^1) is most plausibly one or more of the four elements taken in a specific quantity.

In the following table, I expand the collection of material presented in TAB.1 according to the concepts just introduced.

S^1 (DM^2 of S^2)	**SM^1 of S^1 (DM^1 of S^2)**	→	**S^2**	**SM^2 of S^2**	**Through**
1. σπέρμα	Four elements	→	Plants and animals	Body of the organism	--
2. Lump of gold	Gold	→	Statue of Hermes	Gold	Change of figure
3. Block of stone	Stone	→	Statue of Hermes	Stone	Subtraction
4. Twigs	Wood	→	Bundle	Twigs	Addition
5. Bricks, planks, cement	The four elements	→	House	Bricks, planks, cement	Composition
6. Graphite	Carbon	→	Diamond	Carbon	Alteration (of matter)

TAB.2

Now, I believe that the two categories of starting points of change on the left of the arrow stand in the following reciprocal relation with the end points of change on the right of the arrow.

By definition, the instances of substances (S^1) in the first column represent the diachronic matter out of which the new substance S^2 comes into being (DM^2). S^1's are instances of lower-level substances than S^2's, and as such they are in turn composed out of a synchronic matter (SM^1) and a certain formal feature. This formal feature is either extremely low in complexity and

[134] For the sake of clarity, this is the kind of matter that several scholars refer to as "functional matter".

determinateness (such as the form of lumpness and being-block may be) or simply coincides with the privation of a proper form (the figurelessness of non-being-composed).

The second column presents a collection of the synchronic matter out of which each S^1 is ontologically composed (SM^1). As SM^1 is the matter of S^1, and S^1 is the diachronic matter of S^2 (DM^2), SM^1 is in turn the diachronic matter of S^2 (DM^1). Being an element of S^1, DM^1 (=SM^1) < DM^2 (=S^1).

The new substances generated (S^2's) are also composite beings. I collect in the fifth column the instances of the synchronic matter of S^2 (SM^2).

According to the collection of material presented in TAB.2, endorsing that the substrate of substantial change [c^1] persists through change amounts to showing that one of the following options holds:

Identity persistence: either SM^1 or S^1 are identical with SM^2;

Existential persistence: either SM^1 or S^1 still exist in S^2.

I argue in the next two sections that Aristotle endorses [c^1]. As I have claimed in §5.3, [c^1] is a κοινόν of change. This does not entail, nonetheless, that the mode in which the substrate persists must itself a κοινόν of change. I have claimed that *GC.I.4* contemplates two different modes of persistence for substantial and non-substantial change. Identity persistence applies to every non-substantial change. For instance, $S^1H^- \rightarrow S^1H^+$, where S^1 at each side of the arrow is one and the same substance, for H^-/H^+ are non-substantial feature and do not change therefore what S^1 is. In certain cases of substantial change, such as [2-6] in TAB.2, identity persistence holds. In other cases ([1]), nonetheless, the substrate fails to persist remaining identical to itself. Nonetheless, I argue that, in these cases, the substrate persists in an existential sense.

In the next two sections, I expand on the instances of substantial change enlisted in TAB.2, in order to show that Aristotle endorses [c^1], and in what sense [c^1]1 applies to each case of substantial change.

5.6.3. Evident cases of persistence. Artefacts.

I first analyse cases [2-6] in which the diachronic matter of S^2 (namely S^1) *evidently* persists through substantial change. These are mainly [2-5] cases of production of artefacts, which are evidently considered by Aristotle as standard cases of substantial change, even if the ontological status of artefacts and their capacity to qualify as substances is not always clear in Aristotle's *Corpus*. I believe that Aristotle chooses to analyse these cases of substantial change, because they make [c^1] immediately evident. In fact, [2-5] are characterised by identity persistence, which is the most evident mode of persistence. Let us briefly go through each of these cases of substantial change.

[2] A lump of gold is moulded into the form of Hermes, thus undergoing a change in figure from shapelessness at t^1 to shapedness at t^2. This change of figure results in the production of the statue of Hermes. In the process of moulding, the gold that is the SM^1 of the lump of gold (S^1) and the DM^2 of the statue of Hermes (S^2) persists as identical to itself as the SM^2 of S^2. The process of substantial change occurring is not related to the matter, but rather to the shape. In S^1, the gold lacks the shape of Hermes; in S^2, the same gold is endowed with the shape of Hermes. In [2], [c^1] holds, for SM^1 at t^1 is identical with SM^2 at t^2.

[3] A block of stone is carved into the statue of Hermes. By subtracting spatial parts out of the stone (SM^1), SM^1 loses its shapelessness and acquires the shape of Hermes at t^2. As in [2], the identity condition for persistence is fulfilled, for SM^1 is identical with SM^2; in fact, the stone remains stone through the process of carving. Unlike [2], which allows for conservation of the mass, in [3], the quantity of SM^1 is not identical with the quantity of SM^2, for carving entails a process of subtraction. In [3] (as in [2]), [c^1] holds, for SM^1 at t^1 is identical with SM^2 at t^2. From a mereological/quantitative point of view, unlike in [2], in [3] SM^2 is part of SM^1.

[4] Several twigs (S^1) existing separately at t^1 are collected and tied together at t^2 to produce a bundle (S^2). Now, the bundle is not identical with the twigs, for it is rather identical with the twigs that have been informed by their being collected and tied together. Moreover, the matter of the twigs (SM^1) does not coincide with the matter of the bundle, namely with the twigs considered in abstraction from their being-gathered and being-tied. Rather, the material components of S^2 (SM^2) are identical with S^1 (the twigs), on the proviso that, at t^2, the twigs have

lost their separateness and their substantiality. When they are tied together into the bundle, the twigs exist dependently on the bundle as its material constituents. Once the band or rope tying the twigs together has been cut and the twigs are scattered around, they start again existing as independent substances. In [4], [c^1] holds, for S^1 at t^1 is identical with SM^2 at t^2.

[5] This case of substantial change should be reconstructed, I believe, in a similar way as the previous one. Bricks, planks and cement exist at t^1 as independent substance and in a state of lack of reciprocal composition. At t^2, they are composed into the composite whole of the house (S^2). Now, S^2 is not identical with either S^1 or SM^1, for it is rather identical with S^1 informed by composition. Rather, in [5], [c^1] holds, for S^1 at t^1 is identical with SM^2 at t^2.

[6] This instance of substantial change is presented in a quite nebulous way. I reconstruct it using as paradigm the coming into being of a new chemical substance (e.g. diamond) out a different, preexistent chemical substance (e.g. graphite) through the alteration of its chemical structure. Diamond and graphite are two different substances, but are composed out of the same matter, namely out of atoms of carbon. Let us assume that a lump of graphite buried several miles under the surface of the Earth is exposed to a dramatic variation of temperature and pressure. As a consequence of this variation, the atoms of carbon out of which the lump of graphite is composed undergo an alteration in the kind of chemical bond and in their spatial disposition. As a result of this alteration, a new substance, the diamond, comes into being. Despite being composed out of the same matter as the graphite (i.e. atoms of carbon), the diamond differs from the graphite with relation to its form. Therefore, the coming into being of a crystal of diamond out of a lump of graphite through a process of alteration of their common synchronic matter obviously entails [c^1]. In [6], [c^1] holds, for SM^1 at t^1 is identical with SM^2 at t^2.

In conclusion, I have shown that the cases [2-6] of substantial change are all clear evidence of the fact that Aristotle endorses [c^1] with relation to substantial change. They are carefully chosen examples on two grounds. First, because they immediately suggest that [c^1] is the case. Second, because they present us with a vast range of different kinds of substantial change, thus securing the solidity of the inductive argument supporting [c^1]. I wrap up my results in the following table.

	A at t^1	**Is identical with**	**B at t^2**	**Notes**
2	SM^1 (gold)	is identical with	SM^2	
3	SM^1 (stone)	is identical with	SM^2	Quantitatively, SM^2 is a part of SM^1
4	S^1 (twigs)	is identical with	SM^2	At t^1, S^1 is a substance; at t^2, it is not.
5	S^1 (bricks, planks, cement)	is identical with	SM^2	At t^1, S^1 is a substance; at t^2, it is not.
6	SM^1 (atoms of carbon)	is identical with	SM^2	

TAB.3

5.6.4. Fishier cases of persistence. Organisms.

I now turn to analyse case [1], which is both the most complex example and the example most commonly invoked against [c^1].

[1] entails a whole causal story that *Phys.I.7* omits to provide. The coming into being of a plant or of a human being out of their relevant diachronic matter is twined with a series of non-substantial changes (alteration of the material substrate, growth…). Moreover, it requires to distinguish among several layers of matter: the primary diachronic matter (the seed, the menses), the synchronic matter of the organism (i.e. the body in its whole), its homogeneous and non-homogeneous parts (the relevant organs that are necessary for each kind of organism); the intermediate stages between the diachronic matter and the organism (e.g. the embryo).

It is not a case that [1] is used as a counterexample for [c^1]. Most obviously, in fact, the synchronic matter of S^2 does not coincide with the diachronic matter of S^2. The plant is not composed out of the seed, and the human being is not composed out of the menses.

I believe that this counterargument rests on the failure to qualify the relevant levels of matter persisting through change, as well as the mode of persistence proper to [1]. I argue that [c^1] can be shown to hold with relation to organisms, provided that we clarify correctly at what level of

analysis matter can be said to persists, and in which sense. Once we have operated the relevant conceptual distinctions, the complex case of the coming into being of organisms can be shown to square with the previous, simpler and more evident cases of persistence.

With relation to [1], the synchronic matter constituting (S^1) a pre-existing material substance (i.e. the seed and the menses) functioning as the diachronic matter of (S^2) the new substance (i.e. the plant, the human being) can be shown to persist through the process of substantial change. Thus, showing that [c^1] holds in case [1] amounts to clarifying at what level of analysis of S^1/S^2 into their material components the identity condition holds. Or to switch to the weaker existential condition, claiming that the synchronic matter of S^1 (SM^1) still exists in S^2.

S^1 (DM^2 of S^2)	**SM^1 of S^1 (DM^1 of S^2)**	→	**S^2**	**SM^2 of S^2**	**Through**
1a. Seed	Four elements	→	Plant	Trunk, leaves, roots…	Growth, alteration, …
1b. Menses[135]	Four elements	→	Human being	Human body	Growth, alteration, …

TAB.4

In the process of substantial change, the seed and the menses do not persist as such, thus fulfilling the ὅλον condition from *GC.I.4*. In fact, both the seed and the menses lose their status of substances, once the new substance has come into being. As the anti-traditionalists rightly notice, S^1 does not persist as such in S^2. Without delving into biological details that are irrelevant for the present purpose, the process leading from the seed and the menses to the organism can be summarised in the following way.

At t^1, S^1 (the seed, the menses) are, at least to some extent, substances. Even being in a sense parts of an organic and complex substance (the tree, the female human being), they nonetheless enjoy some sort of separate existence by virtue of being the material principles of another substance.

[135] This translates the Greek word σπέρμα, which prevalently means the animal seed and the seed of plants (i.e. their diachronic matter). Aristotle's standard position on animal generation is that the menses are the (diachronic) material cause, whereas the seed is the moving cause of generation. In *GA.I.20*, nonetheless, σπέρμα refers to the menses, or rather to a certain fertile principle within the menses. I take our passage to use this sense of the term, and refer generically to the menses, regardless whether Aristotle means something more specific within the menses.

Within the span of time t^1-t^2, S^1 undergoes a complex series of necessarily-concurrent non-substantial changes.[136] These entail the growth of S^1 through nourishment, namely by virtue of the addition of particles of the same kind as those constituting S^1 (i.e. of the same kind as SM^1). As the seed and the menses are comparatively simple material substances, their SM^1 is a mixture of the four elements in peculiar reciprocal proportions concocted in a certain way. During the process of growth of SM^1, S^1 undergoes alteration, as the homogeneous mixture of the four elements is gradually diversified into the non-homogeneous material components that constitute S^2 (SM^2, the organs).

When the necessary, concomitant non-substantial changes have been accomplished, in a determinate time t^2, the passage from S^1 to S^2 is accomplished. S^1 has ceased to exist as an independent substance and a whole new substance has come into being.

If the process of coming into being of organisms can be described as I did, it is evident that there is a substrate persisting through the passage from S^1 to S^2, namely SM^1. In fact, it is the case that:

SM^1 persists existentially in S^2, for SM^1 still exists in S^2.

As a matter of fact, this can also be spelled out according to the identity condition, provided that we further analyse S^2 into its remote matter (i.e. into the synchronic matter of SM^2):

S^1 (DM^2 of S^2)	**SM^1 of S^1 (DM^1 of S^2)**	→	**S^2**	**SM^2 of S^2 (proximate M of S^2)**	**SM of SM^2 (remote M of S^2)**
1a. Seed	Four elements	→	Plant	Trunk, leaves, roots… (non-homogeneous M)	Four elements (homogeneous M)
1b. Menses	Four elements	→	Human being	Human body (non-homogeneous M)	Four elements (homogeneous M)

TAB.5

Once we have analysed S^2 down to its remote matter, [c^1] can be shown to hold, for

SM^1 is identical with the remote matter of S^2 (identity persistence).

[136] For the sake of brevity, I mean with S^1 both the original diachronic matter of S^2 or some intermediate stage of it. In the case of animal generation, what undergoes the aforementioned processes of non-substantial change is probably the embryo, rather than the menses themselves.

In conclusion, I have shown that [c^1] can be defended also in the more complex case of coming into being of organisms. This case is fishier than the previous ones, because neither S^1 nor SM^1 are identical with SM^2. Nonetheless, [c^1] holds, for SM^1 still exists in S^2 (existential persistence); and for SM^1 is identical with the remote matter of S^2 (identity persistence).

5.6.5. Conclusion.

I have claimed that, against a well-established recent interpretative line, Aristotle endorses that [c^1] the substrate persists through substantial change. This claim is first made with relation to change in general, and should therefore be expected to hold of substantial change as well. Nonetheless, a doubt on the applicability of [c^1] to substantial change is raised by the fact that [a-c], the κοινά of change, are argued for by assuming non-substantial change as a paradigm for change in general. Whereas explicitly argues for that [a-b] hold of substantial change, he does not do the same with relation to [c].

I have claimed that Aristotle does not explicitly argue for [c^1], but selects instances of substantial change ([1-6]) that evidently show that [c^1] is true.

In cases [2,3,6], the synchronic matter of S^1 obviously persists in S^2 and constitutes its synchronic matter (SM^1=SM^2). In cases [4-5], it is S^1 itself that persists in S^2 and constitutes its synchronic matter, thereby losing its substantiality, i.e. its independent existence (S^1=SM^2).

The only case that may raise doubts is [1] the coming into being of organisms such as the human being and the plant out of, respectively, the menses and the seed. In these cases, it is evident that neither the seed and the menses (S^1) nor the four elements (SM^1) are identical with SM^2. I have shown that the difficulty can be solved in two ways. First, by invoking existential persistence, namely by claiming that SM^1 persists through the coming into being of the organism, for it still exists in S^2. Second, by analysing SM^2 into its own synchronic matter. SM^1 persists through the coming into being of the organism, for it is identical with the remote matter of S^2 (i.e. with SM of SM^2).

5.7. The analysis of the end point of change. Substrate and form as per se principles of natural things.

The enquiry proceeds with the analysis of the end point of change (190b17-29). This section is introduced with a blast of trumpet, even if it may seem to be the mere continuation of the analysis of the sources of change started in the previous section.

> *Phys.*, I.7, 190b17-20
>
> φανερὸν οὖν ὡς, εἴπερ εἰσὶν [a] αἰτίαι καὶ ἀρχαὶ τῶν φύσει ὄντων, [b] ἐξ ὧν πρώτων [c] εἰσὶ καὶ γεγόνασι [d] μὴ κατὰ συμβεβηκὸς [e] ἀλλ' ἕκαστον ὃ λέγεται κατὰ τὴν οὐσίαν, [f] ὅτι γίγνεται πᾶν ἔκ τε τοῦ ὑποκειμένου καὶ τῆς μορφῆς·
>
> In conclusion, if there are [a] causes and principles of natural things, [b] primary [sources] out of which [c] they are and have come into being [d] non-coincidentally, [e] but rather each said according to substance, it is evident that [f] every [natural thing] comes into being out of the substrate and the form.

On the one hand, the present section is the accomplishment of the analysis of the composite sources of substantial change into their elements (substrate, form and privation) initiated in the previous passage.

On the other hand, it is evident that the second stage of the analysis of the sources of natural change, namely the analysis of the composite end point of substantial change into its elements, is presented as the crowning of the enquiry into the principles of natural things, and thus of the whole pursuit of *Phys.I.*

5.7.1. What the principles of natural things are.

Phys., I.7, 190b17-20 ([a-e]) represents the key passage to establish what kind of principles are looked for in *Phys.I*. I have already dealt with the question in the introduction. Here, I confine myself to summarise my results and defend them, where necessary.

5.7.1.1. Principles, causes and elements of natural things ([a]).

As I have claimed in the *Introduction* (cf. §0.2.), the principles searched for in *Phys.I* are the internal principles or elements of natural things, as opposed to the external principles (the

moving and the final causes). This kind of principles are labelled interchangeably as principles (ἀρχαί), causes (αἰτίαι) and elements (στοιχεῖα), regardless the distinction between αἰτία and στοιχεῖον drawn in *Metaph.V.1-3*.

The equivalence of the three terms is particularly evident in [a], where, due to its conclusive value, we would most expect to find the term στοιχεῖον. Instead, Aristotle here labels the internal principles natural things as ἀρχαί and αἰτίαι.

This notwithstanding, that Aristotle is concerned with the internal principles of the natural world is clear both from parallel texts such as *Metaph.XII.2-4* and from the arguments following our passage. As I show in §5.7.2, Aristotle claims that matter and form are the principles of natural things, for they are the elements composing both natural things and their essence.

5.7.1.2. The causal field of the principles of natural things ([c]).

I have interpreted Args.1-2 of *Phys.I.5-6* as arguments claiming that the contraries and the substrate are principles of natural things either with relation to being or with relation to change.[137] This interpretation hinges on the difference in meaning of the verbs εἶναι and γίγνεσθαι. [c] supports my interpretation, if καί is understood as "and".

Nonetheless, it is possible to understand καί as epexegetic, for the formulas ἐξ οὗ/εἰς ὅ εἶναι are occasionally used as synonyms of ἐξ οὗ/εἰς ὅ γίγνεσθαι. If this were the case, the distinction between principles of being and principles of change may seem to collapse.

Some support against my claim on the causal field of the principle may be gained from the opening of *Phys.I.7* (189b30-2), where Aristotle claims that the enquiry will turn on change. Nonetheless, the enquiry into change soon reveals itself as an enquiry into the *things* that change. Namely, as the analysis of what-comes-to-be and of what-has-come-to-be. The analysis contained in *Phys.*, I.7, 190a13-b29 is the analysis of the things that function as starting points and as end points of change into their elements.

Moreover, the definitive answer on the identity of the principles of natural things provided in *Phys.I* mentions only change (190b20): "every [natural thing] comes into being out of the

[137] For my justification of this endorsement, cf. §0.3.2.

substrate and the form". After two brief arguments (190b20-23), this result is restated.[138] Nonetheless, the arguments in 190b20-23 hinge on the ontological composition of the end point of change and of its definition. Thus, a claim about the principle of substantial change (190b20, 23) is argued for through the being and ontological composition of natural substances. Matter and form perform two different kinds of causal action with relation to natural things.

In conclusion, I have claimed that the principles of natural things searched for in *Phys.I* perform two explanatory tasks. Namely, they account both for the capacity to change and for the ontological composition of their objects. The principles of natural things are related to two causal fields: change (γίγνεσθαι) *and* being (εἶναι).

5.7.1.3. The source condition and the priority condition of the principles of natural things ([b]).

I have dealt with the basic notion of principle, as well as with the source and priority conditions in the *Introduction* (cf. §0.3.1), and applied these concepts throughout my analysis of *Phys.I.5-6*. Here, I just need to point out that, as in my analysis of Args.1-2 of *Phys.I.5-6*, the principles are required to fulfil the source and priority conditions with relation to two causal fields, namely change and being. In other words, the principles of natural things are required to be that out of which natural things primarily both are composed and come into being. Namely, A is a principle of natural things, if natural things have come into being out of A and are ontologically constituted out of A, and if there is no B out of which A has come into being and is ontologically constituted. In our passage, the source condition and the priority condition for being principle, as well as their application to two different causal fields, are expresses by the formula ([b-c]) ἐξ ὧν πρώτων εἰσὶ καὶ γεγόνασι.

5.7.1.4. The categorical dimension of the principles of natural things: substance ([d-e]).

Finally, [d-e] set the categorical dimension of the principles of natural things. The principles of natural things must be selected within the category of substance.

[138] *Phys.*, I.7, 190b23: δῆλον οὖν ὡς γίγνοιτ' ἂν τὰ γιγνόμενα ἐκ τούτων [ἐκ τοῦ ὑποκειμένου καὶ τῆς μορφῆς].

The formula λέγεται μὴ κατὰ συμβεβηκὸς ἀλλὰ κατὰ τὴν οὐσίαν seems to refer to substantial metaphysical predication.[139] *Phys.*, I.7, 190b17-20 argues that the principles of natural things are the elements of the end point of substantial change. What [d-e] makes clear is that only the elements that are predicated of each other substantially (and not coincidentally, as in the case of "man is white") qualify as principles.

I understand [d-e] as qualifying the verbs εἶναι and γίγνεσθαι in [c].

The principles of a certain natural things are the principles causing it to have come into being; not those explaining its change in size or quality or place.

Moreover, the principles of a certain natural thing are its ontological consituents, namely the substantial elements of the thing that has come into being.

Let us consider the case of substantial change in which a baby is born, and she happens to be white. Now, white is a component of the end point of substantial change, the baby. Nonetheless, according to [e], white fails to qualify as a principle, for it is predicated of the baby coincidentally.

Furthermore, let us consider the baffling case in which a coincidental property necessarily accompanies a certain substantial change. For instance, the birth of a baby necessarily entails a process of growth. Now, even if a difference in size between the embryo and the baby is necessary to the process of birth, the size of the baby does not qualify as her principle, for size is predicated of the baby coincidentally.

In conclusion, [d-e] makes clear that the principles of natural things are those out of which they have come into being primarily and out of which they primarily constituted with relation to substance.

5.7.2. Substrate and form as principles of natural things.

After having qualified what the principles searched for in *Phys.I* are, Aristotle states that [f] they are the substrate (or matter) and form. The reference to change alone (γίγνεται) must be meant as

[139] Compare the use of λέγειν Arg.2 of *Phys.I.6*, where it also introduces metaphysical predication, but of a different kind (coincidental metaphysical predication).

a short formula for the definition of the principles of natural things in [a-e], featuring both being and change as the causal fields of the principles. In fact, [f] is supported by an argument ([g]) which is far from being an argument on change, but that may rather be ranked as an argument on being. Thus, [f] introduces matter and form as principles of change, but [g] argues that they are principles of being.

> *Phys.*, I.7, 190b20-3
>
> [φανερὸν οὖν ὡς] […] [f] ὅτι γίγνεται πᾶν ἔκ τε τοῦ ὑποκειμένου καὶ τῆς μορφῆς· [g] σύγκειται γὰρ ὁ μουσικὸς ἄνθρωπος ἐξ ἀνθρώπου καὶ μουσικοῦ τρόπον τινά· [h] διαλύσεις γὰρ τοὺς λόγους εἰς τοὺς λόγους τοὺς ἐκείνων. δῆλον οὖν ὡς γίγνοιτ' ἂν τὰ γιγνόμενα ἐκ τούτων.
>
> [It is evident] […] that [f] every [natural thing] comes to be out of the substrate and the form. [g] For the musical man, in some way, is composed out of man and musical. [h] For one analyses the accounts [of composite things] into the accounts of these things [of their elements]. Therefore, it is evident that the things that come into being have come into being out of these [i.e. out of the substrate and the form].

The claim that [f] the principles of the end point of substantial change, i.e. the principles of natural things, are matter and form is supported by two compositional arguments ([g-h]). As in the previous section, the claim [f] concerning substance is supported by [g] an argument concerning non-substances. Assuming a consistent homogeneity between substantial (i.e. hylomorphic) compounds and coincidental compounds, [g] argues that matter and form are principles of natural things, for they are the elements out of which natural things are composed, in the same way as the musical man is composed out of man and musical. The difference existing between the parts of the substantial compound and the parts of the coincidental compound is marked by the words τρόπον τινά, although it is not spelled out.

A second compositional argument [h] appears to hinge on the relation between definitions and their parts.[140]

A certain degree of textual uncertainty affects line 22. The words τοὺς λόγους have been bracketed by Ross, so that the text would read: "for one analyses [the musical man] into the accounts of these things [of their elements]". The elision has been followed by nearly the totality of the subsequent scholars. It is plausible to consider τοὺς λόγους as an accidental insertion, due

[140] I believe that argument [h] must be referred to [f] rather than to [g], for [f] is the claim endorsed in 190b20-3, and because nothing prevents referring [h] to [f].

to the presence of the same words in following sentence (εἰς τοὺς λόγους τοὺς ἐκείνων). This alleged scribal error must have occurred, if at all, on an early stage of the transmission, due to its extensive presence in the manuscripts. The alternative *lectio* τοὺς ὅρους, contained in E (Par.gr. 1853, 10th AD) and supported by Philoponus, requires an independent explanation.

The elision of τοὺς λόγους (or of τοὺς ὅρους) might be understood as an attempt to avoid the reference to definition in [h]. Once the reference to definition is eliminated, [h] becomes the specular counterpart of [g].

Even if one were to reckon this result were a *desideratum*, it is evident that Ross' elision is not sufficient to secure it. In fact, εἰς τοὺς λόγους τοὺς ἐκείνων can hardly be understood without making reference to a definitional context. I believe that it makes sense to maintain τοὺς λόγους (or τοὺς ὅρους) in its place. The most natural sense of the argument, given the definitional context suggested by εἰς…ἐκείνων, is, I believe, the following. Matter and form are principles, for the account of the composite thing (and not the composite thing itself, as in [g]) is analysed into the accounts of its elements, i.e. into the accounts of matter and form.

In conclusion, I have claimed that matter and form qualify as principles of natural things with relation to change and being. As the rationale for matter and form to qualify as principles of being rests on two compositional arguments, I take the principles of being to be meant in a compositional sense, i.e. as substantial elements. Being a substantial element is spelled out in [g-h].

In the first sense, matter and form are principles, for natural things are constituted by them as substantial elements. If we analyse the end point of substantial change, e.g. the baby, we come up a broad variety of properties belonging to her, along with her matter (the human body) and her form (the form of the human being and/or her individual form). Among these components, only matter and form qualify principles, for only matter and form are substantial elements of the baby.

In the second sense, matter and form are principles, for they yield the substance *of* the end point of substantial change, i.e. its essence. In dealing with the essence and definition of the hylomorphic compounds, Aristotle makes clear in several passages through the *Corpus* that both matter and form – or rather, material and formal substance – contribute to the essence and

definition of the hylomorphic compounds. For instance, the essence of the brazen circle must contain both its matter (the bronze) and its form (the circle). Or the essence of the human being must contain both her matter (the human body) and her form (the soul).

The relation between matter and form in definition, and the possibility and the mode of their unity, are not topics broached in *Phys.I*. At this stage of the enquiry, it is sufficient to state that matter and form are principles and elements of natural things in virtue of the fact that they account for the substance of natural things, being substantial components of natural things, as well as components of their essence and definition.

5.8. Privation as a coincidental principle of natural things.

One of the projects undertaken by *Phys.I.7*, I have claimed, is the clarification of the reciprocal relation among the three principles established. *Phys.*, I.7, 190b17ff. presents various ways of understanding this relation, which I analyse in the next section. Instrumental to this project is the clarification of the role of privation as a principle of natural things.

The claim is that privation is a derivative principle. Two arguments are provided. (1) Privation is not an element of the analysis of the end point of substantial change. Rather, it is coincidental to matter, whenever matter is considered in itself, namely in abstraction from the form it undertakes in the the point of substantial change. (2) Privation is coincidental to form, for it is only a mode of the form, namely its absence.

5.8.1. Privation is not an element of the end point of substantial change.

The following text recapitulates the three principles of natural substances and expands on their reciprocal relation with respect to the analysis of the end point of substantial change achieved in the previous passage. In lines 17-23, Aristotle had argued that the principles of natural things, coinciding with the elements of the end point of substantial change, are the matter and form out of which the end point of change and its definition are composed. Matter and form are still the focus of the recapitulation in *Phys.*, I.7, 190b23-9 (cf. [i, l]), but a brief reference to the relation between privation and matter is added.

Phys., I.7, 190b23-9

ἔστι δὲ [i] τὸ μὲν ὑποκείμενον ἀριθμῷ μὲν ἕν, εἴδει δὲ δύο ([j] ὁ μὲν γὰρ ἄνθρωπος καὶ ὁ χρυσὸς καὶ ὅλως ἡ ὕλη ἀριθμητή· τόδε γάρ τι μᾶλλον, καὶ οὐ κατὰ συμβεβηκὸς ἐξ αὐτοῦ γίγνεται τὸ γιγνόμενον· [k] ἡ δὲ στέρησις καὶ ἡ ἐναντίωσις συμβεβηκός)· [l] ἓν δὲ τὸ εἶδος, οἷον ἡ τάξις ἢ ἡ μουσικὴ ἢ τῶν ἄλλων τι τῶν οὕτω κατηγορουμένων.

[i] And it is the case that the substrate is one in number and two in form. [j] For [it is], on the one hand, the human being, the gold and the countable matter in its whole; and these are more a certain this, and out of these what comes into being comes into being non-coincidentally. [k] On the other hand, the privation and the contrariety are coincidental.

[l] The form, instead, is one; for instance, the orderly disposition, the music and all the other things that are said in this way.

The contrast governing the passage is that between the way in which matter and form must be counted.

[i] M is one in number, but two in form, for

[j] M is a this and a non-coincidental principle of substantial change, and

[k] M is coincidentally F^{-}.

[l] F is one simpliciter (both in number and in form).

It is clear that [j, k] are meant to pinpoint a contrast between matter and the privation inhering in it, but do it in a very concise way. [j] attributes to matter the characters of [j^1] being a this and [j^2] a per se principle of substantial change; privation's character of merely coming to coincide with the matter is supposed to contrast both.

The character of being a this [j^1] is attributed to matter only comparatively (μᾶλλον) and not absolutely, for *Phys.I* does not mean to solve the problem whether matter or form are substance to highest (or absolute) extent. *Phys.*, I.9,192a1-6 tackles the Platonists' failure to tell matter apart from privation. The Platonists, overlooking the fact that what in one in number need not be one absolutely, have endorsed that matter is the opposite to the Forms, and as such a non-being. Instead, claims Aristotle, even if matter is numerically one with privation, it is nonetheless formally distinct from it. For matter is "close to and to some extent substance" (ἐγγὺς καὶ οὐσίαν πως), whereas privation is not a substance, for it is rather per se a non-being. Matter, instead, is a non-being only coincidentally, namely by virtue of the fact that privation comes to coincide with matter.

I expand on the rationale for the identification of privation and non-being in the next section, where I claim that privation is the absence of form, but that the converse in not true. What our passage makes clear is that matter (e.g. the gold) possesses a certain degree of determination. The gold out of which the statue of Hermes is composed is this patially determinate, particular piece of gold that is such and such and different from other materials and from other pieces of the same material. The privation of the statue of Hermes, instead, is nothing determinate, or is hardly anything determinate. I argue in the next section that the only (defective) sense in which privation may qualify as something determinate is the exclusion of its corresponding form. This, nonetheless, accounts for a capacity of determining that is both extremely scarce and derivative.

I have claimed that matter qualifies as a full-blown principle of natural substances, for it is a substantial element of the end point of substantial generation and a part of its definition. The same holds for the form. As such, matter and form are also the full-blown principles of substantial change. No argument is provided with relation to change, but we may think that Aristotle has the capacity of the principles to determine their product in mind. Matter persists through change and determinates thus what the product is (e.g. a statue *of gold*). Form supervenes, informing the gold as a statue of Hermes.

The privation of the form, instead, is only coincidental to the matter of the end point of change. Privation cannot qualify as a full-blown principle, and this on two grounds.

First, for privation is not an element of the end point of substantial change. When we analyse the golden statue of Hermes and its definition into its elements, these are the gold and the form of Hermes. The privation of the form of Hermes inhering in the lump of gold before the process of production is accomplished does not persist through change, for it and the supervened form are incompossible. Therefore, it does not belong to the element of the end point of substantial change.

Second, privation does not determine the process of change to any extent. For, even if the fact that the substrate is deprived of F in t^1 may represent a necessary condition of the coming into being of F in t^2, still the privation of F does not contribute to the identity of the end point of change.

There is a certain tension between the necessity for privation to qualify as a source of change and its failure to qualify as a full-blown principle of change. It is probably for this reason that Philoponus[141] understands the character of being coincidental of privation as referring only to being and ontological composition, thus accepting privation as a full-blown principle of change. This reading, I believe, is contradicted by 190b17ff, where Aristotle makes clear that he is going to expand on the principles of both change and being.

Thus, a stronger argument than the fact that privation is a source of change is implicitly requested by 190b17ff. in order for something to qualify as a principle of change. I suggest that the failure of privation to qualify as a full-blown principle of natural change hinges on the failure of privation to account for the determinacy of the end point of change.

How does this negative state of affairs stand in relation with the claim that [k] privation is coincidental to matter?

When matter is understood as the material element of the end point of substantial change, then matter is informed. In which sense in privation coincidental to the matter of the end point of substantial change?

To be sure, the coincidence invoked in [k] rests on the relation of numerical unity enjoyed by matter and privation, but does not identify with it. If it identified with it, the numerical unity between matter and privation assessed with relation to the starting point of change (cf. 5.3.3.) would be one of coincidence, and the starting point of substantial change MF^- would be a coincidental compound. This, nonetheless, does not seem to be the case.

Privation inheres coincidentally in the matter, when matter is considered as an end point of change. Matter and form coincide numerically in the end point of change and are both per se principles, for they are the product of the analysis of the end point of change. Moreover, they are parts of the definition of the end point of change. Let us consider again TABS.2,4 and integrate them with the missing information for a complete hylomorphic analysis.

[141] Philoponus 2009, *ad loc.*

S^2	SM^2 (SM of S^2)	F^{2+} (F^+ of S^2)	F^{2-}
1a. Plant	Trunk, leaves, roots	Vegetative soul	Privation of the soul
1b. Human being	Human body	Rational soul	Privation of the soul
2. Statue of Hermes	Gold	Form of Hermes	Privation of Hermes
5. House	Bricks, planks, cement	Form of the house	Privation of the house

TAB.6

According to our passage, matter (SM^2) and form (F^{2+}) are per se principles. The privation of the same form, instead, qualifies as a principle only coincidentally, i.e. in so far as it comes to constitute a coincidental numerical unity with matter (SM^2).

Matter qualifies as the non-coincidental part of the coincidental numerical unity SM^2F^{2-}, probably on two grounds. First, because it is one the elements of the substance that has come into being (S^2) resulting from the process of analysis of the end point of change. Second, because it is comparatively more substantial than privation.

If we consider the lacking of soul or of the form of Hermes, there is little doubt that material elements such as the human body or gold have better claim to qualify as a this than the privations do. Even if, when it functions as a material part of the hylomorphic compound, the gold has lost its separate existence, it is nonetheless a certain determinate material instead of another. The gold that has lost its separate existence in the stature of Hermes is endowed with a certain range of properties and with a determinate nature. The privation of the form of Hermes, instead, possesses no determinacy whatsoever; rather, it is the lack of determinacy pertaining to the gold composing the statue of Hermes, when it is considered in abstraction of the form of Hermes. If we consider the statue of Hermes with relation to its matter rather than with relation to its form, then we consider the gold as a matter endowed with a determinate nature, but lacking the form of the hylomorphic compound.

Let us contrast the coincidental status of the privation inhering in the matter of the end point of substantial change (S^2) with the numerical unity of privation and matter in the starting point of substantial change (S^1).

At t^1, the gold exists as the synchronic matter of a material substance such as the lump of gold (S^1). The lump of gold is as proximate to being an independent substance as it is possible for

gold, since the separately existent lump of gold qualifies as a low-order substance whose being – on an ideal continuum stretching from being-material to being-formal (cf. *Meteo.IV.12*) – is extremely close to matter. Nonetheless, the lump of gold is a (material) substance with determinate spatial coordinates, borders, qualities, essential properties. In short, the lump of gold has a determinate nature that can be said to amount to a high extent to that of its synchronic matter (gold). The lump of gold at t^1 is, thus, a separately existing substance composed out of the gold (SM^1) and a certain formal determinacy of a low order (the lumpness).

Now, what is the privation composing the lump of gold to which Aristotle refers? The lumpness, in fact, is a to such a great extent indeterminate form, that it may be thought as coinciding with a privation. This intuition is probably not on the right track. Let us take form in a seminal sense, namely as what provides a substantial determinacy to a given matter. In this sense, there will be low-order forms and high-order forms, according to the degree of determinacy that a certain form has capacity to lend to a certain matter.

On the one hand, it is true that the lumpness is to a great extent an indeterminate formal feature, for a lump has any possible figure (from regular to wildly irregular), any quantity and any quality of which its synchronic matter is capable (smooth and rough, light and dark…). As such, the lumpness may seem to identify with a privation of form, rather than with a low-order form.

On the other hand, it is nonetheless true that the lumpness defines and shapes to some extent the gold into a substance, although of the lowest possible rank and to the lowest possible degree.

Thus, although the conceptual distinction is a fine (or possibly thin) one, I believe that the privation mentioned as a starting point of change is not the same one as the form of the material substance.

What does it refer to, then? The following table presents a hylomorphic analysis of the substance functioning as the starting point of the substantial change leading to the coming into being of the hylomorphic compound (S^2=SM^2F^{2+}). Moreover, it collects the possible candidates for what privation as a starting point of change is. It should be kept in mind that the analysis of the starting point and end point of change pursued in *Phys.I.7* has the accomplishment of the hylomorphic compound as its implicit *Leitfaden*. Thus, a candidate is the privation of the form (F^2) of the hylomorphic compound (F^{2-}), pertaining to the lump of gold (S^1), in that it is the

starting point of the change towards S^2. Another candidate is F^{1-}, namely the privation of the lumpness pertaining to the gold, when we considering the lump of gold with relation to its matter.

S^1	**SM^1**	**F^{1+}**	**F^{1-}**	**F^{2-}**
Lump of gold	Gold	Lumpness	Privation of the lumpness	Privation of the form of Hermes

TAB.7

The privation that functions as a starting point of substantial change and that is one non-coincidentally with matter is F^{2-}. The privation of the form of the hylomorphic compound (i.e. of what-has-come-into-being) includes both F^{1+} (the lumpness) and F^{1-} (the privation of the lumpness). In fact, both the form of the lump and its privation inhering in the gold are privations of the form accomplished by the lump of bronze at the end of the process of substantial change of which it is a (composite) starting point. Since it is an immediate element of the starting point of change *considered with relation to the end point of change*, F^{2-} is not a coincidental element of the starting point of change, as well as SM^1.

Thus, as the gold is a being endowed with a determinate nature, it is a this to a greater extent than privation is. As it is an ontological element of the hylomorphic compound, the gold is a principle per se.

S^1 (DM^2)	**SM^1**	**F^{2-}**
Lump of gold	Gold	Privation of the form of Hermes

TAB.8

A distinction must be drawn between the privation of the form of the hylomorphic compound (F^{2-}) considered with relation to the end point of change and with relation to the starting point of change.

If we consider privation (F^{2-}) with relation to the end point of change, and therefore as a principle of natural things (because the elements of S^2 are the principles of natural things, according to our passage), what follows can be assessed about privation in contrast with matter.

Since privation is the lack of the formal determinacy pertaining to the gold when the gold is considered as the matter of the statue of Hermes (i.e. as DM^1), then privation does not qualify as

a this. The gold (SM^1=DM^1), instead, being a determinate matter (i.e. gold instead of, say, silver), qualifies as a this to a greater extent than privation. To be sure, Aristotle does not assess whether matter qualifies as a this in an absolute sense.

If we consider privation S^1 with relation to the end point of change (i.e. as DM^2 of S^2), then S^1 is ontologically composed out of SM^1 (gold) and F^{2-} (the privation of the form of Hermes). As such, privation (F^{2-}) is said to be one in number with SM^1, but not to be merely coincidental to matter, for it is an ontological element of S^1.

In this case, the privation of the form of the end point of change (F^{2-}) includes both the form of S^1 (F^{1+}) and the privation thereof (F^{1-}). Both the lumpness and the privation of the lumpness, in fact, lack F^2.

S^1 (lump of gold)	**SM^1**	**F^{1+}**	**F^{1-}**
In itself	Gold	Lumpness	Privation of the lumpness
With relation to S^2 (= DM^2 of S^2)	Gold	F^{2-} = Privation of the form of Hermes	

TAB.9

If we apply to the starting point of change the same analytic procedure accomplished in *Phys.*, I.7, 190b20-3 with relation to the end point of change, then it appears that the per se principles of S^1 are SM^1 (the gold) and F^{1+} (the lumpness). These are per se principles of the starting point of change considered in itself, for they are the results of the analysis of it into its constituting elements.

When the starting point of change is considered with relation to its matter alone, abstracting from the form informing it, then a different kind of privation than the one mentioned above must be considered: the privation of F^{1+} (F^{1-}). Thus, going back to the example above, when we consider the lump of gold with relation to its matter alone, then the gold is endowed with the privation of the lumpness. As the privation of the lumpness (F^{1-}) is not an element of the starting point of change, but rather inheres in the matter when it is considered in abstraction from the lumpness, then F^{1-} is a principle of S^1 only coincidentally.

In conclusion, I have claimed that *Phys.*, I.7, 190b23-9 argues that the privation of the form of the end point of change (F^{2-}) is a coincidental principle of natural things, for it is not an ontological element of the end point of change (S^2). Rather, it inheres coincidentally in the synchronic matter of S^2 (SM^2), when it is considered in abstraction from its form (F^{2+}). In reality, SM^2 is informed by F^{2+} (namely, by what S^2 is from the formal point of view). Thus, in S^2:

SM^2 is F^{2+} per se, and

SM^2 is F^{2-} coincidentally.

Which entails that:

F^{2+} and SM^2 are principles per se, and

F^{2-} is a principle only coincidentally, namely by virtue of coinciding numerically with SM^2.

When (SM^2) the matter of the hylomorphic compound that has come into being (S^2) is considered as such, i.e. in abstraction from its form:

SM^2 is a unity only from a numerical point of view, for

SM^2 it is rather composed out of two formally distinct items: SM^2 and F^{2-}.

Unlike SM^2, F^{2+} is a unity both numerically and formally:

F^{2+} is a unity *simpliciter* (both numerically and formally).[142]

Moreover, with relation to their degree of determinacy, the elements constituting the numerical unity of SM^2, when this is considered in abstraction from F^{2+}:

SM^2 is more a this;

F^{2-} is less a this.

As an aside, I have enquired into the role of privation as a principle of the starting point of change (S^1).

[142] This may seem in contradiction with 191a7-12 (see the following section), where the form is said to be twofold, namely itself and its privation.

First, I have disambiguated F^{2-} from the form of the starting point of substantial change (F^{1+}). F^{1+} is, in most cases, a low-order form with little capacity to determine the matter of S^1 (e.g. the lumpness). They are different, for the lumpness possesses an (albeit small) positive import, whereas a privation is only the absence of its corresponding form.

Second, I have applied to S^1 the same kind of ontological analysis applied to S^2. It has appeared necessary to distinguish two different kinds of privation: the abovementioned F^{2-} and F^{1-}, namely the privation of the form of S^1 (F^{1+}), e.g. the privation of the lumpness.

When S^1 is considered with relation to the end point of change, so that S^1=DM^2, F^{2-} (e.g. the privation of the form of Hermes) is a per se principle of the starting point of change, for it is a constitutive element of it.

When S^1 is considered in itself as a substance (and not as the starting point the process of coming into being resulting in S^2) the matter and form constituting S^1 (SM^1 and F^{1+}) must be considered as per se principles of S^1. The privation of F^{1+} (F^{1-}), instead, is a coincidental principle of S^1, for is not a constitutive element of S^1, but rather inheres in SM^1, when S^1 is considered with relation to matter and in abstraction from the form.

5.8.2. Privation and form. The reducibility of privation to its corresponding form.[143]

The next passage is presented after two different models of triad of principles have been explored (*Phys.*, I.7, 190b17-191a3):

> (Model a) M/F^+ are per se principles; F^- is a coincidental principle (s. above);
>
> (Model b) F^+/F^- are the only principles with relation to number; $M/F^+/F^-$ are principles with relation to the account.

The passage contains a reflection on the priority of form over privation, and thus on the possibility of reducing privation to form. This reflection is inserted in the text as an aside, neither fully developed in itself nor developed into a further model of triad.

[143] I have already presented part of the following material – in a different form – in Trentini 2016, 196-200.

Phys., I.7, 191a3-7

> πόσαι μὲν οὖν αἱ ἀρχαὶ τῶν περὶ γένεσιν φυσικῶν, καὶ πῶς ποσαί, εἴρηται· καὶ δῆλόν ἐστιν ὅτι δεῖ ὑποκεῖσθαί τι τοῖς ἐναντίοις καὶ τἀναντία δύο εἶναι. τρόπον δέ τινα ἄλλον οὐκ ἀναγκαῖον· ἱκανὸν γὰρ ἔσται τὸ ἕτερον τῶν ἐναντίων ποιεῖν τῇ ἀπουσίᾳ καὶ παρουσίᾳ τὴν μεταβολήν.
>
> In conclusion, it has been said how many – and in which way how many – the principles of natural things are with relation to coming into being. And it is evident that something must underlie the contraries, and that the contraries are two. In another sense, this is not necessary, for, in order for the contraries to produce movement, only one of them is sufficient, by virtue of its presence or absence.

The claim of the passage is presented as a limitation (Model b). This limitation concerns the role of privation as an independent principle, for, it is claimed, privation can be reduced to a mode of the form, namely to the absence thereof. Thus, F^+ and F^- are not to be reckoned as two distinct principles, but rather as a single one principle. Namely, as:

F^+ → as present: F^+;
→ as absent: F^-.

The model of triad derived from the reducibility of privation to form is close to (Model a). In fact, the reducibility of F^- to a mere mode of F^+ entails that F^+ is a full-blown principle alongside M, whereas F^- qualifies only as a derivative principle.

> (Model a'): M/F^+ are per se principles; F^- is a coincidental principle, for F^- comes to coincide with F^+.

Our text, in its conciseness, neglets not only to spell out the consequence of its claim on the relation among the three principles, but also to provide a complete account of the reducibility of privation to form. The possibility to reduce privation to its corresponding form hinges on the ontological priority of F^+ over F^-. F^+ and F^- are, in fact, not interchangeable. If it is true that F^- is the absence of F^+, it is false that F^+ is the absence of F^-:

> True: $F^- = \neg F^+$
>
> False: $F^+ = \neg F^-$

The rationale for the priority of form over privation is not spelled out in *Phys.I.7*. This has to do, at least partially, with the fact that the conceptual machinery of *Phys.I* is not as rich as that presented in other texts with the same agenda. I reconstruct here three main rationales for the

priority of form over privation, in the attempt to bridge the argumentative gap left open in our brief passage.

(1) Form is prior to privation with relation to the teleological order of natural change. This teleological perspective is absent from *Phys.I*, which confines itself to the internal principles of natural things, omitting the moving and final cause. This notwithstanding, the principles of natural things are identified with the principles of what-has-come-into-being, which, in more complete accounts of natural change, is teleologically prior to ceasing to be. Thus, although *Phys.I* does not explicitly commit to the idea that coming into being is teleologically prior to ceasing to be, it is possible to believe that *Phys.I* assumes the priority of coming into being without providing the rationale thereof. Engaging in the project of grounding the teleological priority of coming into being would, in fact, require a conceptual machinery which is not proper to an introductory text such as *Phys.I*. Another possible interpretation of the identification between the principles of natural things and the principles of what-has-come-into-being is that, whenever we consider any change between two sources of change, be it $F^+ \rightarrow F^-$ or $F^- \rightarrow F^+$, the principles of natural things are always the principles of the end point of change. In this perspective, the principles of natural things would not restrict to F^+ (as the end point of teleologically-oriented coming into being), but would rather include both F^- and F^+ (as non-teleologically-oriented end points of change).

Whichever option we choose for the interpretation of the interpretation of *Phys.I*, it is clear that, in more complex and complete accounts of nature (such as *Metaph.VIII*), coming into being (at least in standard cases) is a process in which a certain determinate matter changes towards a form which coincides with its proper end, i.e. with what its own good. In this scenario, coming into being is a process oriented towards a form F^+ that coincides with an end and the good.

As sources of change considered within a teleological framework, forms and privations are ordered into two axiologically-oriented columns. One column contains the sources of change that succeed in qualifying as ends and as good (F^+); the other column contains the sources of change that fail to qualify as such (F^-).

Now, coming into being and ceasing to be are teleologically oriented in a relation of ontological priority. In fact, ceasing to be occurs necessarily in dependence of the previous occurrence of coming into being, for it is not the matter (the human body) that changes into the corpse, but

rather the hylomorphic compound (the human being). Accordingly, the end point of ceasing to be (F^-) is teleologically posterior to the end point of coming into being.

(2) Form is prior to privation with relation to the capacity of matter. This claim is actually part of the picture presented in (1), for it hinges on the intrinsic capacity of matter. Nonetheless, it merits separate consideration. Different, determinate kinds of matter have different, determinate capacities (C) for different, determinate kinds of actualities (A). In short, M^1 has $C(A^1)$, M^2 has $C(A^2)$ and so on. In a process of coming into being, the actualisation, at t^2, of the capacity that is potential at t^1 is the realisation of the particular, determinate form for which each particular, determinate matter has capacity. Thus, M^1 has $C(F^{1+})$, M^2 has $C(F^{2+})$ and so on. The capacity of matter is not for the privation, but rather for the form. Explaining this claim would require us to bring in the advanced teleological machinery developed in *Phys.II*, *Metaph.VIII.4-5*, *Meteo.IV.12*, *Somn.Vig* and other texts. As an overview, forms and privations belong to two different columns that are axiologically-oriented. Forms can qualify as ends, whereas privations, fail to qualify as such, for they fail to qualify as good. There are cases in which a privation qualifies as instrumental to the good and the end (e.g. sleep, for it has the function of enabling and preserving the wakefulness). In other cases, privations are teleologically neutral, for their form also is (e.g. the eclipse). At the bottom of the scale, privations are evil, for they are the absence of the state of *entelecheia* reached by the matter when it realises the form it is intrinsically oriented towards.

In conclusion, within a teleological context, form is prior to privation with relation to the capacity of matter, for the matter has capacity for the form, and only coincidentally for its corresponding privation (for privation is the absence of the form).

(3) F^+ is prior to F^-, for F^- fails to qualify as the principle of formal determinacy of F^+. This failure hinges on the indeterminacy of privation. A case study of the most common instances of privations throughout the *Corpus* shows that privation is consistently described as indeterminate.

Indeterminacy appears to be constitutive of privation, if we consider Aristotle's favourite definition of privation.[144]

[144] Also: *Metaph.*, IV.2, 1044a15ff; IV.6, 1011b15-22.

Metaph., X.4, 1055b3-8

> ἡ δὲ στέρησις ἀντίφασίς τίς ἐστιν· ἢ γὰρ τὸ ἀδύνατον ὅλως ἔχειν, ἢ ὃ ἂν πεφυκὸς ἔχειν μὴ ἔχῃ, ἐστέρηται ἢ ὅλως ἢ πὼς ἀφορισθέν (πολλαχῶς γὰρ ἤδη τοῦτο λέγομεν, ὥσπερ διῄρηται ἡμῖν ἐν ἄλλοις), ὥστ᾽ ἐστὶν ἡ στέρησις ἀντίφασίς τις ἢ ἀδυναμία διορισθεῖσα ἢ συνειλημμένη τῷ δεκτικῷ·
>
> And privation is a certain contradiction. For [something] lacks either *simpliciter* or in a determinate way, [respectively,] either [in the case of] what is incapable possessing *simpliciter* or [in the case of] non-possessing what can be possessed by nature. […] Therefore, privation is a certain contradiction, or an incapacity that is determinate and intertwined with what is receptive [i.e. with the substrate].

This definition both draws a distinction and a similarity between two kinds of opposition. I concentrate here on the similarity. As a species of the genus of contradiction, privation is constitutively the negative counterpart of a certain positive feature (F^+). Thus, $F^- = \neg F^+$. In this connection, privation appears to encompass the entire scope of what falls out of F^+. As such, privation lack any proper capacity to identify a certain group of beings endowed with positive common features. In fact, the set F^-, as it coincides with the set $\neg F^+$, includes items that are radically heterogeneous to each other, but that share at least one feature: non-being-F^+. As non-being-F^+ is a merely negative feature, the capacity to determine of privation amounts or is proximate to zero. Even if we were to grant the latter option, it is clear that the (close-to-zero) degree of determinacy apparently lent by privation depends in reality on its positive counterpart F^+. Thus, from this point of view, privation is constitutively indeterminate.

The criticism to the philosophers (such as Plato) who employed privative differentiae in their diairetic/definitory praxis may be understood against this background.

PA, I.3, 642b20-24

> Ἔτι στερήσει μὲν ἀναγκαῖον διαιρεῖν, καὶ διαιροῦσιν οἱ διχοτομοῦντες. Οὐκ ἔστι δὲ διαφορὰ στερήσεως ᾗ στέρησις· ἀδύνατον γὰρ εἴδη εἶναι τοῦ μὴ ὄντος, οἷον τῆς ἀποδίας ἢ τοῦ ἀπτέρου ὥσπερ πτερώσεως καὶ ποδῶν. [Text: Louis 1956]
>
> Further, it is necessary to divide by privation, and the dichotomists do so divide. But there is no differentia of a privation *qua* privation; for there cannot be species of what is not, for example of footlessness or of featherless, as there are of featheredness and of feet. [Transl.: Balme 1992 (1972)]

In short, the text both recognises the necessity of operating the division by privation, as dichotomists do. The result of such a diairetic process is a couple of opposing differentiae of the

kind D^+/D^-, where D^- is the privation of D^+. Unlike the dichotomists, Aristotle refutes nonetheless that D^- may qualify as a differentia in itself, namely as a privative differentia.

The argument for this claim can be understood as a refutation. (a) By definition, D^- coincides with $\neg D^+$, for D^- is the privation of D^+, and privation is a certain contradiction. (b) Now, if D is a differentia, then, by necessity, D identifies a species. (c) But a negative feature such as $\neg D^+$ is not capable to identify a species, for non-being does not have species. (d=C) Therefore, D^- does not qualify as a differentia.

For the sake of my argument, (a,c) are important premises. (a) is assumed implicitly as a fact about privation. (c) is a consequence of (a) that appears to be endowed with a priori transparency. In fact, a species is a set of items with one determinate feature in common that is essential to each and every item. Now, the lack of a feature (D^-) cannot possibly identify any definite set of beings possessing a positive, definite, essential characteristic. In fact, D^- does not identify with any positive feature and is rather indeterminate.

A limitation to the idea that privation is constitutively indeterminate, nevertheless, may be represented by the privations that functions as an end point of ceasing to be. For example, the privation of the soul in the corpse, unlike the privation of the soul in the menses, appears to account for a certain degree of determinacy of the corpse. In fact, being-corpse qualifies the human body as a corpse instead of anything else whatsoever.

In what follows, I explore the more cautious idea that indeterminacy may belong to privation constitutively at least when privation is a starting point of substantial change. This claim is presented in *Metaph.VII.7*, which shares with *Phys.I* the project of spelling out the ontology of natural things through the consideration of natural change.

> *Metaph.*, VII.7, 1033a13-16
>
> ὧν δ’ ἡ στέρησις ἄδηλος καὶ ἀνώνυμος, οἷον ἐν χαλκῷ σχήματος ὁποιουοῦν ἢ ἐν πλίνθοις καὶ ξύλοις οἰκίας, ἐκ τούτων δοκεῖ γίγνεσθαι ὡς ἐκεῖ ἐκ κάμνοντος·
>
> And with relation to the things whose privation is unclear and without name, as [the privation] of any form whatsoever in the bronze or [the privation] of the house in the bricks and wood – also in these cases, [these things] appear to come into being as [the healthy] precedes out of the unhealthy.

The text explores the failure of privation to fulfil the synonymy principle and thus transfer its (negative) identity to the end point of productions. The examples of privations provided in our passage are the same as the ones we find in *Phys.I*: the privation of the form of the house the bricks and the privation of the form of the statue in the wood or in the bronze. More importantly, these kinds of privations are said to be "unclear and without name". The common speaker oversees that these privations are the one starting point *out of which* the products come into being, rather claiming that this is matter. And since the starting point out of which something comes into being does not persist, common speakers, in referring to the products, mention matter with modifiers (e.g. "golden statue" instead of "gold statue"). This erroneous linguistic use entailing the false belief that matter fulfils the synonymy principle only defectively, stem from the failure of the common speaker to tell privation apart from matter. This failure is fostered by the fact that the privation of the form of the statue and the privation of the house are indeterminate, and therefore difficult to identify.

In conclusion, I have shown that privation is reducible to form, for privation – either constitutively or at least with relation to the type addressed in *Phys.I* – for it is indeterminate and thus incapable of qualifying as a principle of formal determinacy. The only sense in which privation is (at least to a minimum extent) determinate is a derivative sense, namely dependently on the form (in so far as $F^- = \neg F^+$).

(4) Wrapping up the results of this section, I have suggested three rationales for the claim that form is prior to privation. The first two rationales are drawn from considering change and its natural, teleological order. The third rationale rests on the failure of privation to qualify as a principle of formal determinacy, due to its constitutive indeterminacy.

5.9. The accomplishment of the First project of *Phys.I.7*. The accomplishment of the doctrine of the principles of natural things.

The previous section has achieved a negative result: there are at least two senses in which privation fails to qualify as a principle. 190b17-191a12 presents several models of triad (or dyad) of principles, each accounting for a certain relation among the principles.

5.9.1. Matter and form as per se principles of natural things. Privation as a coincidental principle.

(Model a) and (Model a') order the three principles with relation to their difference in aetiological status.

(Model a):[145]

M/F^+ are per se principles, for they are elements of the end point of substantial change.

F^- is a coincidental principle, for F^- is not an element of the end point of substantial change, but merely comes to coincide with M.

Matter and form are said to be principles of natural things in a non-derivative, per se way, because they are the ontological elements into which the substance that has come into being is analysed. Likewise, matter and form are also the parts of the definition of the hylomorphic compound that has come into being. Privation, instead, qualifies as a principle only derivatively and coincidentally. Namely only as far as it comes to coincide with matter, when matter is considered in abstraction from the form informing it.

Phys., I.7, 191a3-7 presents another rationale for reducing privation to a coincidental principle of natural things; this time, with relation to the form.

(Model a'):

M/F^+ are per se principles;

F^- is a coincidental principle, for F^- comes to coincide with F^+. For $F^- = \neg F^+$ and $F^+ \neq \neg F^-$.

Thus, (Model a) and (Model a') present the same result: matter and form are per se principles; privation is a principle only coincidentally. The defective aetiological status of privation hinges on its reducibility to both form and matter. When matter is considered in absence of the form, then privation inheres coincidentally in the matter. Moreover, privation is coincidental to the form, for it is only the negation of the form, and negations are coincidental to their affirmative counterparts.

[145] Cf. *Phys.*, I.7, 190b23-9.

5.9.2. Principles with relation to the account and with relation to the number.

A different way of understanding the relation between the three principles is according to their numerical unity and their difference in account.

(Model b):

With relation to number: only two principles: (composite) F^-; (composite) F^+.

With relation to the account: three principles: M; F^+; F^-.

Considered as numerical unities with relation to their formal determinacy, the principles of natural things are confined to the opposites (F^-; F^+). What-is-formed and what-is-formless; what-is-composed and what-is-scattered; what-has-a-figure and what-is-figureless.

On a closer look, these opposites are composite beings (MF^-; MF^+). Now, it has become clear that matter is different in being from the opposites inhering in it. Therefore, if we consider the principles with relation to the account, there are three distinct principles of natural things: matter, form and privation.

5.10. The solution of the aporia on the number of principles. The fulfilment of the second project of *Phys.I.7*.

After having accomplished the analysis of the starting point and end point of substantial change, as well as having identified the principles of natural things as the elements of the end point of substantial change, Aristotle goes back to the solution of the aporia on the number of principles raised in *Phys.I.6*. I have labelled the solution of the aporia the second project of *Phys.I.7*, in order to differentiate it from the first project, namely from the accomplishment of Aristotle's own doctrine of the natural principles. I have also claimed that these two projects coincide to a certain extent, for solving the aporia on the number of principles amounts to clarifying the relation among matter, form and privation. Drawing on the results of the first project, 190b29ff. presents the solution to the aporia on the number of principles.

Phys., I.7, 190b29-191a3

διὸ ἔστι μὲν ὡς δύο λεκτέον εἶναι τὰς ἀρχάς, ἔστι δ' ὡς τρεῖς· [a] καὶ ἔστι μὲν ὡς τἀναντία, οἷον εἴ τις λέγοι τὸ μουσικὸν καὶ τὸ ἄμουσον ἢ τὸ θερμὸν καὶ τὸ ψυχρὸν ἢ τὸ

ἡρμοσμένον καὶ τὸ ἀνάρμοστον, [b] ἔστι δ' ὡς οὔ· ὑπ' ἀλλήλων γὰρ πάσχειν τἀναντία ἀδύνατον. λύεται δὲ καὶ τοῦτο διὰ τὸ ἄλλο εἶναι τὸ ὑποκείμενον· τοῦτο γὰρ οὐκ ἐναντίον. [c] ὥστε οὔτε πλείους τῶν ἐναντίων αἱ ἀρχαὶ τρόπον τινά, ἀλλὰ δύο ὡς εἰπεῖν τῷ ἀριθμῷ, οὔτ' αὖ παντελῶς δύο διὰ τὸ ἕτερον ὑπάρχειν τὸ εἶναι αὐτοῖς, ἀλλὰ τρεῖς· ἕτερον γὰρ τὸ ἀνθρώπῳ καὶ τὸ ἀμούσῳ εἶναι, καὶ τὸ ἀσχηματίστῳ καὶ χαλκῷ.

Therefore, it must be said that, on the one hand, the principles are two, whereas on the other hand they are three. [a] And, on the one hand, it [must be said] that the principles are the contraries. For example, one says that [they are] the musical and the unmusical, the hot and the cold, what is joined and what is not joined. [b] On the other hand, this does not hold, for the contraries do not suffer action from each other. And this [problem] is solved by endorsing that the substrate is something different, for the substrate is not a contrary. [c] Therefore, on the one hand, the principles are no more than the contraries; they are, so to say, two by number. On the other hand, they are not two in every sense, by virtue of the fact that being belongs to each of them in a different way. Thus, they are three, for the being of the man is different from the being of the unmusical, and the being of the formless is different from the being of the bronze.

In [a], Aristotle presents the First horn of the aporia as (at least in a certain sense) a sound possibility. The possibility to reckon the First horn as true is explained in [c], and signalised in [a] by the use of substantive adjectives such as τὸ μουσικὸν and τὸ ἀνάρμοστον (respectively, for non-substantial and substantial beings). These terms, in fact, contain a certain ambiguity between the property and the thing possessing that property. [b] presents the Second horn of the aporia, supporting it with the same counterargument to the First horn provided in *Phys.I.6* (Arg.1: if contraries were the only principles of natural things, change would be impossible).

The First and Second horn of the aporia are thus both presented as true, which, if their truthfulness were not qualified according to different respects, would lead to contradiction. This task is undertaken in [c], which takes up the distinction between being one in number and being one in form drawn in 190a13ff.

Thus, [c] makes clear that, when the starting point and end point of change are considered with relation to their number – namely, as the privative thing undergoing change and as the informed thing resulting from change –, then the principles of natural things are exhausted by the two opposites. Numerically, it is true to say that natural things come into being and are ontologically composed out of their form (F^+) and out of the privation of this form (F^-).

When, instead, the numerical unities of the starting point and of the end point of change are considered with relation to their being or their account, then it is clear that the principles are three, namely matter, form and privation. When we say that what is unformed (F^-) at t^1 comes to

be formed (F^+) at t^2, the starting point and the end point of change are meant as composite beings. In fact, there is something underlying F^-/F^+, namely a certain matter, that is different in form or in account from both F^- and F^+. Thus, the starting point and end point of change are actually M^1F^- and M^2F^+.[146]

In conclusion, considered with relation to their being or to their account, it is clear that the principles are three: M, F^-, F^+. The necessity of this claim rests on the necessity of the alterity claim ($M \neq F^-$ or F^+) that had been shown in *Phys.I.6* through two reductive arguments, one of which is contained in [b]: if M were identical with either F^- or F^+, then change would have to occur by direct action of F^+ on F^-, which is impossible. Therefore, there must be a third principle functioning as a substrate of change, and this principle must not be reducible to either of the opposites.

6. Conclusion.

I have started this enquiry with a question on Aristotle's rationale for positing privation as a principle alongside matter and form. Intuitively, characteristics such as formlessness, disarrangement, scatteredness, figurelessness are unappealing candidates to perform the role of principle. First, we expect a principle to account for the determinateness of its results; but privations seem to lack the positive content necessary to the task. Second, privations belong to the sphere of non-being; therefore, they seem incapable to account for the fact that their results exist.

I have provided a study of the triad of principles – matter, form and privation – in *Phys.I*. There are several rationales for engaging with this text.

First, numerous texts are important for hylomorphism, but only few present an extended version of hylomorphism including privation. In more advanced versions of hylomorphism than the introductory one presented in *Phys.I*, matter and form are endorsed as principles within the

[146] If the substrate persists only existentially (i.e. by undergoing change itself). In §5.6, I have shown that Aristotle endorses that the substrate persists through substantial change, and clarified the two senses in which sense it persists. If the substrate persists remaining identical, then $M^1=M^2$, and the starting point and the end point of change are actually MF^- and MF^+.

framework of the four causes, whereas privation is dropped. An example of this is represented by the development of the argument on the principles of natural things in *Metaph.XII.1-3*. *Metaph.XII.1-2* notoriously presents a summary of the arguments of *Phys.I.4-7*, culminating in the endorsement of the triad of principles of matter, form and privation. In taking up this result and developing on it, *Metaph.XII.3* silently lets privation drop and adds the moving and final cause. *Phys.II.1* witnesses a similar conceptual move. As I have argued in the *Introduction* (§0.2.), *Phys.I* and *Phys.II* constitute a continuous enquiry, where *Phys.II* brings the results of *Phys.I* to a higher level of complexity. Namely, to the teleological account of the four causes, which had been prepared in *Phys.I.9* by the dialectical confrontation with Plato's theory of a privative matter yearning for the form. *Phys.II.1*, in presenting the four causes, confines the mention of privation to the claim that it is also, to some extent, a form. The arguments for the defective aetiological status of privation provided in *Phys.I.7* presents a rare occasion to analyse the relation between privation, matter and form and their respective aetiological status.

Second, other texts employ the triad of matter, form and privation, but hardly anywhere else than in *Phys.I* is the triad extensively justified and defended against different views (e.g. Monism). The same holds in general for hylomorphism, which represents the core of the triad of principles of *Phys.I*.

Reconstructing the arguments for the triad of principles presented in *Phys.I* is a tough task. I have endorsed, along with Ross (1936), Kelsey (2008[b]) *et all.*, that *Phys.I.4-7* represents a continuous line of argument. Thus, I oppose a long-standing tradition that has confined itself to the analysis of *Phys.I.7*, implicitly or explicitly downgrading the previous chapters as merely dialectical.

It is beyond doubt that *Phys.I.4-6* are partially dialectical. *Phys.I.4* collects the doctrines of the predecessors as endorsing the general result that there are three principles of natural things: two contraries and the substrate. *Phys.I.5-6*, in arguing respectively for the former ones and the latter one, heavily rely on the framework of the predecessors and make large use of examples from their doctrines. This notwithstanding, it is clear that *Phys.I.5-6* present arguments that Aristotle is willing to accept in his account of the principles in *Phys.I*.7, provided that they undergo a certain degree of reformulation.

This reformulation pursues the agenda of providing an account of substance, which the predecessors failed to do. There are two main differences between the triad of the predecessors and Aristotle's own triad. First, the kind of opposition qualifying as a principle changes from contrariety to form/privation. Contrariety does not extend to substance; form and privation do. Second, the majority of the predecessors failed to grasp the indeterminate nature of matter, reducing it to contrariety. Both these shortcomings of the triad of the predecessors contribute to the aporia on the number of principles raised at the end of *Phys.I.6*.

Due to the second point, it is not clear whether the principles are only the contraries (First horn) or also the substrate (Second horn). It appears, in fact, that the substrate is itself a contrary, so that it is sufficient to posit contrary principles. The First horn of the aporia, nonetheless, has been decisively refuted by two arguments in *Phys.I.6*. The last of these arguments, hinging on the priority of the substantial substrate over its contrary predicates proper to coincidental metaphysical predication, undermines the claim of the contraries to qualify as principles, thus marring the internal coherence of the Second horn. Thus, the triad of the predecessors is faced with difficulties whose solution leads to Aristotle's own triad of matter, form and privation. Thus, the reconstruction of *Phys.I.4-7* provides us with the rationale for Aristotle's doctrine of the three internal principles and for its core, hylomorphism. In doing so, *Phys.I* shows us the rationale for positing privation as a principle.

Third, *Phys.I* presents an unparalleled reflection on the role of privation as a principle. As we expect from the results of *Phys.II.1* and *Metaph.XII.2-3*, *Phys.I.7* concludes that privation is a principle only to some extent, whereas matter and form are full-fledged principles. The defective aetiological status of privation hinges on two rationales. First, the fact that privation is not an element of the substance that has come into being (of the end point of substantial change). Second, privation is coincidental to the form, for privation has no determinacy of its own, but represents only the absence of the form.

Other texts reflect the aetiological defectiveness of privation within a full-fledged, teleologically-oriented hylomorphism. In standard cases of coming into being, a certain matter M realises in actuality the form F^+ that it is in potentiality, thus achieving *entelecheia*. Standard cases of coming into being fall under the synonymy principle: what comes into being is F^+ in actuality; the matter is F^+ potentially; the moving cause is F^+ in actuality (but is numerically

different from what comes into being); the final cause is the *entelecheia*, and therefore F^+ itself. *Metaph.VIII.4-5* analyses the intersection between potentiality, teleology and the three principles of *Phys.I*. *Phys.I* considers privation as a starting point of substantial change (of coming into being); *Metaph.VIII.4-5* considers it as the end point substantial change (of ceasing to be).

Now, how does matter relate to form and privation in a teleological perspective? First, coming into being and ceasing to be occur in the same matter. Second, within the order of nature, ceasing to be is coincidental on coming into being, for it occurs in t^2 only on condition that coming into being has occurred in t^1. Third, privations fail to qualify as ends, for they are either axiologically neutral (the privation of light in the eclipse) or merely instrumental (sleep) or utterly negative (the privation of life in the corpse).

In a teleological perspective, matter has, in a proper sense, capacity for the form alone; since privation is coincidental to the form, matter has capacity also for privation, but not in the same way as for form. One and the same matter *can* come to be the form and *can* come to be the corresponding privation. Nonetheless, the verb "can" is employed in these two sentences in two different meanings. The capacity for form is according to the order of nature and leads to *entelecheia*. The capacity for privation is against the order of nature and leads to the loss of *entelecheia*.

Moreover, the matter of coming into being and of ceasing to be is one and the same. Nonetheless, when it is informed, it possesses the (actualised) internal capacity for the form that constitutes its nature. Once the hylomorphic compound has ceased to be, matter is deprived of its capacity for the form (for the corpse does not comes to be the man again). Although it is numerically the same matter as the matter of the hylomorphic compound, it is at the same time different, for its nature has been annihilated in the process of corruption.

The analysis of privation as a principle in a full-fledged, teleologically-oriented hylomorphic perspective is the most natural continuation of this study. The considerable length that this study has gained through the years has dissuaded me from writing in full form the extensive material in my possession on *Metaph.VIII.4-5* and *XII.1-5*, *Somn.Vig*, *Meteo.IV.12*.

In what follows, I recapitulate my results on *Phys.I*.

(1) The principles of natural science sought for in *Phys.I* have to be determined both with relation to their object (as the principles of natural things) and with relation to their causal field or to the quality of their causal action. From a field-related perspective, the principles are responsible for the being and the capacity to change of natural things. With principle of being, Aristotle means the ontological elements out of which natural things are composed with relation to their substance and which constitute their essence and definition.

The duality of the causal fields endorsed in *Phys.I* may be seen as threatening the unity of purpose of *Phys.I*. I have argued, instead, that the same set of principles (matter, form and privation) is responsible both for the being and for the capacity to change of natural things. This claim is grounded on what natural things are. The set of the natural things is identified throughout the *Corpus* as the set of things that are essentially capable of change (and that are perceptible). Thus, if the principles of natural things are sought in *Phys.I* are also the principles of their being, and thus perform the job of accounting for their essence, then they must also account for the capacity to change of natural things.

(2) I have argued that positing privation as a principle is a problematic move. *Phys.I* provides a justification for this move throughout *Phys.I.4-7*. Privation is posited as a principle in so far as it is opposed to the form.

The rationale for this endorsement is expounded in *Phys.I.5*, which argues that the contraries are principles of natural things. The chapter provides two arguments. The first one argues that the contraries are principles of being, whereas the second one argues that the contraries are principles of change.

Arg.1 claims that the contraries are principles, for they fulfil the Condition of ontological simplicity (COS), namely because the are the ultimate elements constituting natural things. I have shown that Arg.1 is dependent on the widespread *endoxon* that natural things are exhaustively composed out of the contraries.

Arg.2, instead, hinges on the fully-Aristotelian claim that (non-substantial) change occurs between contrary poles. I have analysed several possible rationales for this claim, and concluded that the evidence rests on an idea expressed in *Metaph.X.3-4*. Here, otherness (A/¬A) is

contrasted with difference, i.e. the property of belonging to the same genus, but being its two extreme species (e.g. white and black belong to the genus of colour, and are its extreme species). Others do not qualify as termini of change, for they are too remote from each other to act on each other. The things that are different from each other, instead, are both close enough (for they belong to the same genus) and reciprocally other (for they are extreme species of the same genus) to yield reciprocal action. Now, the relation of difference is said to ground the relation of contrariety, so that if H^+/H^- are contraries, then they are reciprocally different.

Similar claims are made in Arg.2 of *Phys.I*. In spelling out the source condition for natural (per se) change, Aristotle establishes two conditions for A and B to qualify as sources of change. First, A and B must be others, i.e. contradictories. If this were not the case, namely if what was A in t^1 were still A in t^2, then no change would occur. The otherness condition is necessary for A and B to qualify as sources of change, but insufficient. In fact, in order for A and B to qualify as sources of change, A and B must be not only contradictories, but also contraries or maximally different. The difference condition is presented as necessary and sufficient, and includes the necessary otherness condition, for, if A and B are contraries, then A and B must also be contradictories.

(3) Having argued in *Phys.I.5* that the contraries are principles, *Phys.I.6* presents two arguments for a third principle, the substrate. Far from simply adding a third principle to the contraries, *Phys.I.6* culminates in a serious aporia on the number of principles. Namely, on whether the principles are two ("the principles are *only* the contraries") or three ("the principles are the contraries and the substrate").

The First horn is supported by the arguments of *Phys.I.5* and rejected by those of *Phys.I.6*. The Second horn is a combination of the weaker version of the First horn ("the contraries are principles") and of the claim that the substrate is a principle. On the one hand, the arguments of *Phys.I.6* argue for this combination. Arg.1 of *Phys.I.6* claims that change is possible only on condition that a third principle is added to the contraries as the subject undergoing change. Subargument 1 of Arg.2 exposes the failure of contrariety to qualify as substance, and invokes a third principle different from contrariety and identifying with the substance of natural things. On the other hand, positing the substrate as a principle to some extent undermines the claim of the contraries to qualify as principles. If we understand the relation between the members of the triad

as a relation of Coincidental metaphysical predication (e.g. Socrates is black) between a substantial substrate (e.g. Socrates) and the non-substantial contraries (e.g. white and black), then the non-substantial contraries seem to fail to qualify as primary, and therefore as principles. Consequently, the Second horn appears to be internally inconsistent.

In conclusion, the aporia on the number of principles presents no viable solution and rests on two problems. First, on the relation between the opposites and the substrate. Is the substrate itself an opposite (First horn) or not (Second horn)? Second, is the substrate prior to the opposites? If it is, then the Second horn appears to be inconsistent, for the opposites fail to qualify as principles. If it is not, then the Second horn is an option.

(4) With relation to the first point, I have shown that, against several modern reconstructions Aristotle's theory of the ultimate material substrate, matter is not reducible to contrariety. The decisive battlefield for the dispute is the theory of the four elements in *GC.II.1-5*. Traditionally, the four elements have been interpreted as compounds of the indeterminate prime matter and of the primary contraries. Several recent interpreters have been led by their *vis polemica* against prime matter to endorse that the four elements are aggregates of the primary contraries.

I agree neither with the defenders of prime matter nor with their opponents. Against the first party, I contend that a prime matter underlying and having capacity for all things is too general and indeterminate to perform any explanatory task. Against the second party, I object that it makes matter a free-floating mixture of contrary properties, thus failing to capture the difference between a property and a thing endowed with a property.

I argue, with the traditionalists, that the four elements are hylomorphic compounds of a common ultimate substrate and two primary contraries. Against the traditionalists, I show that the ultimate substrate is not an indeterminate capacity for everything. Rather, it is a determinate substrate possessing a determinate capacity, namely the capacity for the four primary contraries. In order to differentiate the ultimate substrate from prime matter, I call it primary matter. The determinate capacity of primary matter accounts for the essential properties of a certain province of being, namely of the natural sublunary beings that are composed out of the four elements. Since the four primary contraries are the primary difference of perceptibility, the ultimate substrate can account for the perceptibility of natural, sublunary things. Since the primary contraries are

contraries, the ultimate substrate can account for the capacity to change of natural sublunary things.

Now, primary matter bears a complex relation with contrariety, which has been misinterpreted by Aristotle's predecessors. In *GC.II.1*, Aristotle contrasts two conception of primary matter held by his predecessors. Almost all physicists identified primary matter with one or more of the four elements, and therefore with contrariety. Exceptions to this *endoxon* are Anaximander's *apeiron* and Plato's Receptacle, which are purely indeterminate, actual bodies devoid of contrariety.

Like Plato and Anaximander's matter, Aristotle's primary matter is an actually indeterminate, non-contrary substrate. For it is what it is in potentiality, whereas it is in actuality the four elements. Unlike Anaximander's and Plato's principles, it is necessarily intertwined with contrariety, for it is the capacity for the four primary contraries. Moreover, it is not an indeterminate body existing in actuality. In fact, it is not a body existing in actuality, but rather what the four elements are with relation to potentiality.

In conclusion, Aristotle does endorse – against the First horn of the aporia of *Phys.I.6* – that matter cannot be reduced to contrariety.

(5) The question whether the substrate is prior to the opposites (thus undermining their capacity to qualify as principles) or not is tied to the conceptual shift leading to the principles of substance. The kind of triad of the predecessors fails to account for the principles of natural substances.

Finding a triad of principles fit for the task of explaning natural substances entails a refinement both of what qualifies as a substrate and of the opposites qualifying as principles. This is part of the job accomplished by *Phys.I.7*. I have claimed that *Phys.I.7* pursues two projects:

> Project 1: The accomplishment of the doctrine of the three principles (from S, H^+, H^- to M, F^+, F^-).
>
> Project 2: The solution of the aporia on the number of the natural principles raised at the end of *Phys.I.6*.

With relation to Project 2, the aporia on the number of principles had seemed to concentrate in two conceptual point:

Alterity condition: whether the substrate is or is not something different from the opposites;

Priority issue: Whether the substrate is prior to the opposites (thus undermining their claim to qualify as principles) or not.

Answering these two questions coincides with clarifying three areas:

Task a: The refinement of the kind of opposition qualifying as principle;

Task b: Clarifying the reciprocal relation enjoyed by the principles;

Task c: Clarifying what the substrate is.

This clarification is necessary on the backdrop of the main conceptual shift dividing *Phys.I.4-7* into two parts, namely the shift towards the principles of natural *substances* occurring in *Phys.*, I.7, 190a31.

First, settling the issue of the Alterity condition of the substrate amounts to clarifying (Task c) that the substrate is different in being from the opposites, although it coincides with them numerically in the starting point and end point of change.

Second, settling the Priority issue requires (Task a) the passage from the opposition of contrariety to the opposition of form and privation, which extends within the category of substance. Moreover, (Task b) Since form and privation are substantial opposites, their relation to the substrate is not the same as the relation of coincidental metaphysical predication enjoyed by a substantial substrate and a non-substantial contrary. The kind of relation between matter and form and between matter and privation expressed by substantial metaphysical predication is not exposed to the Priority issue, since all its members are substances.

Thus, the ontological analysis of the substances functioning as the starting points and the end points of substantial change, Aristotle dismisses the idea that the opposites may be subordinated as such to the substrate.

S1 (starting point of change): matter and privation (MF^{2-});

S2 (end point of change): matter and form (MF^{2+}).

Thus, the aporia on the number of principles can be answered in the following way:

> Numerically, the principles are two, namely the (composite) opposites.
>
> With relation to the account, the principles are three, namely the opposites and matter, for matter is different in account from the opposites.

With this, Project 2 has been accomplished. So far, the conceptual machinery applied to the solution of the aporia has also contributes to Project 1, namely to the accomplishment of the doctrine of the principles of natural things.

This has been initiated in *Phys.I.4-6* with the collection of the *endoxon* that the principles are the substrate and the contraries. The arguments provided in *Phys.I.5-6* in support of this claim are arguments that Aristotle wants to endorse, provided that they undergo a certain degree of reformulation and clarification. This reformulation amounts mainly to the shift towards the principles of substance.

> Triad of the predecessors: S, H^+, H^-;
>
> Aristotle's triad: M, F^+, F^-.

The triad of the predecessors, far from being rejected, merely revels itself to be insufficient to account for natural things with relation to their substance. One of its members, the substrate, is a substance, e.g. a man, a lump of gold, a block of stone. The contraries, instead, are non-substantial properties inhering coincidentally in the substrate.

Aristotle's triad situates itself on a deeper level of analysis than the predecessors', for it represents the ontological analysis of the substance constituting the S of the triad of the predecessors. The analysis of substance culminates in the identification of its three constituting elements: matter, form and privation.

> S1 (starting point of change): matter and privation (MF^{2-});
>
> S2 (end point of change): matter and form (MF^{2+}).

It must be noticed that the ontological analysis of the starting point of substantial change proposed is oriented towards the end point of substantial change. For what most deserves the title of principle of natural things is what is a principle of what-has-come-into-being, namely of the

substance that has come into being as the result of a process of substantial change. Considered in itself, the starting point of change is a low-level substance such as the lump of gold. Although extremely proximate to matter, the lump of gold is itself a hylomorphic compound composed out of a matter (the gold) and a low-level form (the lumpness). Thus, the privation of the form of what-has-come-into-being must be differentiated from the form of the starting point of substantial change as what is utterly negative must be differentiated from what is just feebly positive.

In conclusion, matter and form are what best qualifies as principles of natural substances, for they are the elements of what-has-come-into-being, and what-has-come-into-being is what best qualifies as a natural substance.

Full-blown principles of natural substances: matter (M) and form (F^{2+}).

Whereas the form is a unity, matter is twofold, namely itself and the privation of F^{2+}. When the matter of what-has-come-into-being is considered in itself, namely as the matter of what-has-come-into-being independently of it form, then matter coincides numerically with privation. This unity is coincidental, unlike the non-coincidental numerical unity MF^{2-} of the starting point of change, because privation is not an element out of which what-has-come-into-being is composed out of directly, but only pertains to the matter on condition that it is considered in itself.

Moreover, privation is coincidental to the form, for every privation is the absence of its corresponding form, whereas the form is not the absence of its corresponding privation. Thus:

Coincidental principle of natural things: privation (F^{2-}).

> For F^{2-} is coincidental to the M of what-has-come-into-being, when M is considered in itself. And
>
> for F^{2-} is coincidental to F^{2+}.

In establishing what most deserves to be called a principle of natural things (the elements of what-has-come-into-being, matter and form), as well as the role of privation with relation to these, the two projects of *Phys.I.7* come to diverge.

For (Task b) is accomplished, with relation to Project 1, through the construction of two models of relation among the principles:

(Model a/a'):

M/F^+ are per se principles, for they are elements of the end point of substantial change.

F^- is a coincidental principle.

For F^- is coincidental to M, since F^- is not an element of what-has-come-into-being.

For F^- is coincidental to F^+. For $F^- = \neg F^+$ and $F^+ \neq \neg F^-$.

(Model b):

With relation to number: only two principles: (composite) F^-; (composite) F^+.

With relation to the account: three principles: M; F^+; F^-.

Of these models, both necessary to complete Project 1, only (Model b) is relevant to the completion of Project 2, i.e. to the solution of the aporia on the number of natural principles.

(Model a/a'), instead, belongs wholly to the completion of Project 1 and entails a further way of reducing the triad of the natural principles to two, matter and form.

Although one might believe that the core of *Phys.I.7* is to be identified more in the completion of Project 2 than in that of Project 1, it is instead Project 1 and (Model a/a') that reveal themselves crucial for Aristotle's doctrine of the natural principles and its further development into the doctrine of the four causes in *Phys.II*. For (Model a/a') represents the core of the doctrine of the three internal principles of natural substance, namely hylomorphism.

Triad of natural principles (M, F^+, F^-) → (Model a/a') → Hylomorphism (M, F^+ as full-blown natural principles).

In conclusion, matter and form constitute the core of the doctrine of the internal principles of natural substances (i.e. of what-has-come-into-being), for they account for natural substances with relation to three respects:

Ontological composition: M and F^+ are the substantial elements of what-has-come-into-being;

Essence: M and F^+ are the parts of the definition of what-has-come-into-being;

Substantial change: M and F^+ account for the determinacy of what-has-come-into-being.

Privation, instead, fails to qualify as a full-fledged natural principle with relation to all three respects:

Ontological composition: F^- is not an element of what-has-come-into-being;

Essence: F^- is not an element of the essence of what-has-come-into-being;

Substantial change: F^-, despite qualifying as a source of substantial change, fails to account for the determinacy of what-has-come-into-being.

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