The Reciprocal Transformations of Elements*:

The Quick and the Slow

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요 약 문

이 논문에서 나는 기체 (prime matter)에 대한 수정주의를 옹호한다. 아리스토텔레스의 존재론에서 요소 간의 변화를 허용키 위하여, 수정주의에 의하면 기체의 존재를 상정할 필요가 없다. 우선 아리스토텔레스의 '질료' (matter)의 개념을 분석함으로 이 글을 시작한다. 이 분석은 질료에 대한 the material definition, the substratum definition, 그리고 the potentiality definition으로 나눠진다. 둘째로, 기체에 대한 전통적 견해가 여기서 제시되는 질료 개념의 분석을 모두 만족시킴을 보인다. 나아가 근래에 제시된 기체에 대한 중도적 견해를 살핌으로서 전통적 견해의 하나인 '순수가능성'이란 개념은 이해될 수 없음을 보인다. 셋째로, 기체에 대한 수정주의 옹호 논증을 제시한다. 이글의 4절에서 아리스토텔레스가 요소 간의 변화를 (이론적으로) 가능하게끔 하기 위해서 기체를 상정할 필요가 없음을, 그리고 보다 중요하게는 5절에서 '어떤 요소 간의 변화는 다른 요소간의 변화보다 더 많은 시간이 걸린다'는 아리스토텔레스의 발언을 기체에 대한 전통적 견해에서는 설명할 수 없지만, 수정주의는 이를 별 문제없이 설명할 수 있음을 논증한다. 이 글은 기체에 대한 수정주의의 문제점을 몇 가지 지적함으로 맺는다.

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"No area of Presocratics studies is without controversy,"[1] says Patricia Curd in her recent book on Parmenides. Her remark clearly applies to Aristotle's philosophy as well. It is an undeniable fact that Aristotle has made "contradictory" remarks in much of his work especially on metaphysics. The notion of prime matter has been one of the most recalcitrant,[2] and the historical Aristotle cannot be bothered with it. There has to be, nevertheless, a definite answer to the question, "Is Aristotle committed to the notion of prime matter?" For Aristotle's metaphysics either requires it or it does not from a sheer logical point of view, even if the historical Aristotle might have been ambiguous about it.

It would seem to take a "miracle" for an agreed upon resolution to the prime matter controversy from all parties,[3] but it is more reasonable not to believe in such miracles for the reasons that David Hume provides. Instead, we shall "proportion [our] belief to the evidence" as a "wise man" does.[4] We shall take into consideration "the opposition of contrary testimony," "the character or number of the witnesses," "the manner of their delivering their testimony," and "the union of all these circumstances" in so balancing the evidence.[5]

It is found that "we discover a superiority" within the revisionist account of prime matter over the traditionalist one. I shall then argue

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1) Curd 1998, 15

2) Starting with (King 1956), the discussion of the issue has attracted many participants. Recent discussions include (Byrne 1995; Cohen 1984; Graham 1987; Polis 1991).

3) See (Polis 1991, 226-7) for a succinct history of the controversy. He refers to (Brenner 1976; Charlton 1970; Charlton 1983; Code 1976; Cohen 1984; Dancy 1978; Ford 1976; Jones 1974; King 1956; Solmsen 1958; Stahl 1981; Williams 1982).

4) Hume 1975, 110

5) Hume 1975, 112

that we must "incline to [the revisionist account]; but with a diminution of assurance, in proportion to the force of its antagonist"[6] on the basis of the finding. This is accomplished in particular by establishing that the traditionalist account is untenable. A survey on recent literature helps to establish just that. I shall argue for the revisionist account of prime matter in this paper as follows.

First, I shall describe what has been widely accepted as "the traditional doctrine of prime matter."[7] This serves as an initial set up for further discussion. Second, the recent contributions and advances made on the debate will be surveyed. One of the results is that a main traditionalist notion, viz. the prime matter as pure potentiality, is either unintelligible or useless in Aristotelian account of the substantial change. Nonetheless, the finding falls short of persuading authors that the revisionist account accommodates the finding better than the traditionalist account does. They remain convinced of the traditionalist account of prime matter. All authors whose works are surveyed here maintain that a common "matter" is included on Aristotle's ontology as the most basic building blocks of the world, i.e., matter for elements. This is partly because they think that the functional role that Aristotle seems to assign for a common matter cannot be fulfilled without positing prime matter for all elements. Third and last, I shall argue that the role of the common matter to which the traditionalist assigns can be fulfilled without supposing prime matter for all elements. Furthermore, some of the things that Aristotle says about the reciprocal elemental change can be made good sense of only on the revisionist account of prime matter.

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6) Hume 1975, 112
7) Byrne 1995, 198

1. A Functional Definition of 'Matter'

Jonathan Barnes indexes 45 entries of 'matter' (hulé) by Aristotle in (Barnes 1984). Aristotle defines the word 'matter' by specifying what it *is* in some of these entries, while he defines it by specifying what it *isn't* in some others. Here are some of the notable examples of the former use:

> (**M1**) *Phys.I.192a31-3*: [M]y definition of matter is just this—the primary substratum of each thing, from which it comes to be, and which persists in the result, not accidentally.[8)]
> (**M2**) *Phys.II.194b24-5*: [T]hat out of which a thing comes to be and which persists, is called a cause, e.g. the bronze of the statue, the silver of the bowl, and the genera of which the bronze and the silver are species.[9)]
> (**M3**) *GC.I.320a2*: Matter, in the most proper sense of the term, is to be identified with the substratum which is receptive of coming-to-be and passing-away.
> (**M4**) *An.I.412a9-10*: [M]atter is potentiality, form actuality.
> (**M5**) *Met.V.1024b8-9*: [T]hat to which the differentia or quality belongs is the substratum, which we call matter.

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8) Translations are from (Barnes 1984) unless otherwise noted. And Barnes' abbreviations in (Barnes 1995, xxiii-xxv) are used for the titles of Aristotle's works.

9) This is not indexed in (Barnes 1984), but Christopher Byrne takes the passages *Phys.II.194b16-195a25* to be the basis of his understanding of Aristotelian matter. He says that matters are "that out of which something is made or put together" (Byrne 1995, 199), and refers to the passage. (The 'put together' bit is somewhat different from the 'made out of' bit of his definition; but, as the two expressions are disjoined—though this is not the only reason—, there is no real danger of misconstruing Aristotle's definition of 'matter.')

(**M6**) *Met.VII.1029a20-1*: By matter I mean that which is in itself is neither a particular thing nor of a certain quantity nor assigned to any other of the categories by which being is determined.

(**M7**) *Met.VII.1032a17*: [T]hat out of which they come to be is what we call matter.

At least three definitions of the word 'matter' are found from M1 through M7, and these are just some of the notable examples within his works. Both M1 and M2 give what I shall call the 'material definition' (MD) and the 'substratum definition' (SD). What I shall call the 'potentiality definition' (PD) is found in all of M4, M5 and M6.[10] If we combine the three distinguishable definitions of matter, then we get the following *prima facie* definition of 'matter' à la M1 through M7.

(**AM**) *X* is matter if, and, only if (1) **MD**:[11] *x* is that out of which a thing comes to be; (2) **SD**: *x* is that which persists (throughout change); and, (3) **PD**:[12] *x* is potentially something that it actually is not.

I should emphasize that 'matter' is not at all a referring term in AM. It names no individual as matter. It specifies, in other words, those necessary conditions for any individual to qualify as matter. AM then can be understood as indicating that any "functioning" material cause with the features that both SD and PD specify is also matter. It should be obvious that matter can never be the matter of itself; instead,

10) Aristotle seems to directly contradict M6 in *GC.II.320b.16-7*. He says that "[t]he [matter] is something that can never exist without quality and without form."

11) See also M7.

12) See also M3 and M5.

it is always matter of something other than itself. The word 'matter' has no meaning of its own, to put it differently; rather, it comes to denote an individual only when the word 'matter' is coupled with 'of something.'[13] Aristotle's favorite example of matter is "the bronze of the statue" as in M2.[14]

A piece of bronze chiseled into a statue of a particular shape, e.g., Marcus Vipsanius Agrippa, is an example of the substantial change. Socrates having completed his study on the nature of morality, thereby becoming a learned man, on the other hand, is an example of the qualitative change.[15] The sublunary composite Socrates, when he studies to become a learned man in the qualitative (or, accidental) change, meets all three necessary conditions of AM; and, so does the substantial change of the piece of bronze becoming the statue of Agrippa. This is so because the piece of bronze is that out of which the statue comes to be; it is that which persists in the process of the (unqualified) coming-to-be; and, the piece of bronze is also potentially the statue which it is not. The piece of bronze is, furthermore, itself made potentially and ultimately out of the four sublunary elements, viz. earth, water, air, and fire for Aristotle.[16]

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13) Cf. (Byrne 1995, 199). Byrne says that "calling something a material cause [i.e. matter] does not, by itself, attribute any intrinsic properties to it." It is also noteworthy that separate actual existence of prime matter is not part of the traditionalist account of prime matter as Friedrich Solmsen insists in (Solmsen 1958, 243).

14) The example is found also in *Phys.I.191a10*, *Phys.III.207a27*, etc.

15) See (Graham 1987, 478-9) for the discussion of this change. See (Graham 1987, 476, ft. 3) for the discussion of Aristotle's usage of the 'qualified and unqualified coming-to-be'.

16) In *Long. Vit.466a20*, Aristotle says that "the material constituting the bodies of all animals consists of the following—the hot and the cold, the dry and the moist." We may infer that the ultimate matters for sublunary (animal)

Thus, "[i]f you take the extremes, matter is pure matter and the essence is pure definition; but the bodies intermediate between the two are related to each in proportion as they are near to either."[17] Repeated applications of AM to the sublunary composites down to the ultimate (proximate) matters, viz. the four sublunary elements, allow for the "hierarchical arrangement of substances."[18] This arrangement ensures that the word 'matter' is not a referring term. In this way we find Aristotle's four elements at the rock bottom of these layers of substances. We now turn to the traditionalist account of the matter for elements, the rock bottom of matters, the so-called prime matter, or the "pure matter." I shall focus on the reciprocal substantial change of these elements just as the friends of the traditionalist account focused on it in the following section.

2. The Traditionalist Account of Prime Matter

It has been a common practice to distinguish prime (or, the ultimate) matter from the proximate matter as was illustrated above. We need not be concerned about the proximate matter for the moment. We shall focus on prime matter instead.

If we allow ourselves to set aside the issue of whether or not Aristotle is committed to the notion of prime matter, then we may

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composites are those four sublunary elements, given *GC.I.319b1* in which Aristotle says that "these things—fire, earth, water, air—are characterized by the contraries." See also (Byrne 1995, 198-9).

17) *Meteor.IV.390a5*. This remark of Aristotle may also be construed as an evidence of his commitment to the notion of prime matter. We need to be alert, nevertheless, to the fact that it is a hypothetical statement. That is, we simply cannot be certain that he is advancing his own doctrine of matter.

18) Byrne 1995, 198

define ‘prime matter’ as follows, especially when we take seriously the above quoted remark of his from *Meteor*.

> (**PM**) *X* is prime matter if, and, only if (1) **MD'**: *x* is out of which the four sublunary elements are made; (2) **SD'**: *x* is that which persists throughout reciprocal substantial change among elements; and, (3) **PD'**: *x* is that which potentially is any of the elements but actually is not.

The most basic substances are characterized, according to Aristotle, by the two contraries, viz. the hot and the cold, and the moist and the dry. Nevertheless, PM is consistent with the doctrine of contraries. For the four sublunary elements are the most basic substances.[19] The mark of a traditionalist account of prime matter is its addition to PM. If there is anything that meets all of MD', SD', and PD', the traditionalist adds, then there is only one such thing. ‘Prime matter,’ if it exists at all, in other words, does refer to an individual “thing.” This traditionalist ascription of the uniqueness feature to prime matter appears obviously to go against the functionalist analysis of ‘matter,’ that is given above.

It is Aristotle’s own remark—“the four sublunary elements are subject to change”—that fuels the vexing issue of Aristotle’s commitment to the notion of prime matter.[20] The traditionalist claims that such a remark is evidence that these elemental changes are required *theoretically* because without it the elements cannot transform themselves. More importantly, there can no longer be the coming-to-be, nor can there be

19) Cf. ft. 16. It is perhaps implied by his discussions on the four elements in *Cael*., *GC*., and *Meteor*., while I cannot find an explicit statement for this claim in the works of Aristotle’s.

20) Aristotle says that “it has been proved before that [elements] must undergo reciprocal transformation” (*GC.II.332a35*).

the ceasing-to-be, without such transformations of the elements. It is obvious that the world according to Aristotle would soon exhaust itself of the stuff it consists of without the elemental transformation.[21] If any of the elements expires without replacement, then surely there would be less composites at a later time (or, at time *t*1 than at *t*1-1) in the world without a way of regenerating the element. This is so because the elements are, according to the traditionalist, the ultimate material causes for every other sublunary composites. If Aristotle's world runs out of one element, then it would mean the destruction of all the other sublunary composites, given Aristotle's remark that every composite has all four elements in them, albeit some of them have them potentially.

The traditionalist thus has the following two points in favor of his account: (1) Aristotle insists that the four elements (substantially) change into one another, and (2) Aristotle maintains that there can be no change without something that underlies it. I agree with the traditionalist that these remarks of his, for any account of Aristotle's theory to be adequate, has to be made "good"—i.e., they are to be explained under the backdrop of Aristotle's general theory of either the substantial change or that of the qualitative change.[22] This is so

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21) Aristotle's own solution seems to be this. One element's coming-to-be is another element's passing-away. He says that, for example, "the same process is a coming-to-be of this but a passing-away of that, and a passing-away of this but a coming-to-be of that" (*GC.I.318a25ff.*).

22) Sheldon Cohen rejects this as a common mistake of both the traditionalist and the revisionist. Cohen suggests that the common matter for elemental reciprocal change is not prime matter—while maintaining T2, that there is a substratum for elemental change. He says that "[both traditional and revisionist accounts are] wrong in taking Aristotle to be committed to a bare, indeterminate prime matter if he is committed to a common matter for the four elements" (Cohen 1984, 172). Thus, Cohen maintains that Aristotle is not committed to the notion of prime matter with T3 characteristics even with Aristotle's commitment to the

regardless of the theoretical necessity for the elemental transformation, and regardless of the reasons for allowing such elemental change. The traditionalist maintains that Aristotle's commitment to the notion of prime matter can be inferred by the two remarks of his. It behooves us then to consider Aristotle's following remark *per se* about change very carefully, and to decipher it so that it becomes clearer.

Aristotle remarks the following immediately after he proves that there "must be something underlying" for the qualitative change.

> (**C1**) "[S]ubstance too, and anything that can be said to be without qualification, come to be from some underlying thing" (*Phys.I.190b1*).

Where there is change, Aristotle appears to suggest here in C1, there always is a substratum that underlies the change as well.[23] C1 thus can be rendered to give what I shall call the 'substratum thesis,' according to which there is something that persists throughout all changes. Take, for instance, the case of water being generated from earth, the process of which is the destruction of earth[24] at the same time. When water is generated from earth, according to the substratum

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notion of a common matter for the elements. Cohen thinks both the traditionalist and the revisionist are wrong because "Aristotle's case for a common material substratum for the four elements does not derive from a general claim about all change" (Cohen 1984, 173). See below for the characteristics of T1, T2, and T3 of the traditionalist account.

23) Immediately after *Phys.I.190b1*, nonetheless, Aristotle remarks that "these [i.e. 'come to be' and 'come to be so-and-so'] are all cases of coming to be from some underlying thing" (*Phys.I.190b10*). This is the reason why I say that he 'appears to suggest' the substratum thesis. It is not clear with which the comparison is made from the cases of coming-to-be *from some underlying thing*.

24) Cf. ft. 21.

thesis, there must also be something that underlies the generation of water. The traditionalist account identifies prime matter as (roughly) the supposed substratum, which underlies the elemental change. In short, for the traditionalist, the substratum is prime matter, but prime matter is not merely the substratum. Prime matter exhibits, the traditionalist maintains, the following additional "characteristics."

> Prime matter[25)]
> (**T1**) is more fundamental than the four elements,
> (**T2**) underlies the two fundamental contraries: the hot and the cold, the dry and the moist, and
> (**T3**) lacks of any kind of determination, i.e., is a sheer potentiality.

The revisionist dismisses all three of T1, T2, and T3. According to the revisionist, Aristotle's apparent commitment to both the substratum thesis and the reciprocal elemental change do not automatically lead to his commitment to the traditionally understood notion of prime matter. The revisionist provides several different reasons for her rejection, but here are some of the main ones:

> (**R1**) the notion of a sheer potentiality is unintelligible,
> (**R2**) Aristotle can do without prime matter in allowing the elemental changes, and more importantly
> (**R3**) the traditionalist account fails to accommodate Aristotle's remark that some elemental changes take more time than other such changes.

R1 is, I take it, fairly straightforward. If *x* has no actual

25) See (Byrne 1995, 200-1).

determination whatsoever, then we cannot even say that it lacks any kind of actual determination about *x*. For having no actual determination is itself an actual determination. Prime matter is like something that can never be determined by definition, and this implies that it can never be known either. This implication is perhaps to be expected because Aristotle says that "matter is unknowable in itself" in *Met.VII.1036a9*.[26] More importantly, prime matter lacking any actual determination is a poor candidate to fulfill the functional role that the traditionalist assigns thus in making the elemental changes possible. A sheer potentiality is impotent at the level of elements.

That is one of the common views among the accounts that can be called the intermediate one between that of the traditionalist and that of the revisionist. They include three recent works,[27] and the view will be discussed next. Sections 4 and 5 are the arguments for R2 and R3 respectively. To wit, R2 is argued on the ground that it is possible for each element to function as the material cause in the elemental changes. R2 is argued more specifically by an actual illustration of how the change is possible without positing a common matter. Aristotle's remark at *GC.II.332a35ff.* that "the speed with which [elements] come-to-be one out of another is not uniform—since the process of reciprocal transformation is relatively quick between those that tally, but relatively slow between those which do not" will be examined for the argument for R3. We now turn to some of the recent developments

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26) I am treating R1 to be the criticism of unintelligibility. One may treat R1 as a charge about the traditionalist's inconsistency. One surely must not say what prime matter *is* if it really lacks any kind of actual determination. See also (Cohen 1984, 174) for the brief discussion of the disagreement as to R1 between the traditionalist and the revisionist.

27) (Byrne 1995; Graham 1987; Polis 1991)

within the prime matter controversy.

3. An Intermediate Account of Prime Matter

There have been several attempts at an intermediate account of prime matter between the traditionalist account and that of revisionist's. One may come to an intermediate account by dismissing any of T1, T2, and T3 (but not all of them). The rejection of T1 allows for the claim that the four elements are the most fundamental of the sublunary substances; the dismissal of T2 permits the doctrine that there is no common matter for elements;[28] and, the refusal to accept T3 affords something very close to R1 if not something identical to it. The dismissal of any one of T1, T2, and T3 without rejecting them all requires other adjustments as well. The air is thin within the logical space that is explored for the intermediate account of prime matter.

Christopher Byrne maintains that there is a common matter which is the basis for elemental change, but he rejects the traditionalist view that the common matter lacks any actual determination.[29] He agrees with T1, in short, but he rejects T3. Byrne says that "[t]he traditional doctrine of prime matter … does go astray, not in positing the existence of a substratum persisting throughout the reciprocal generation of the material elements, but in claiming that this substratum is itself something wholly potential and indeterminate."[30] Byrne rejects T3 on

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28) To be sure, T2 literally states that prime matter underlies the two fundamental contraries. This is implied, nonetheless, as Aristotle says in *GC.I.3191* that "these things—fire, earth, water, air—are characterized by the contraries, the contraries do characterize the elements." Thus, T2 in fact states that prime matter is the substratum for the elements.

29) (Byrne 1995)

the ground that "[r]egardless of the level of organization or composition, then, something can act as a material cause only if it has a nature of its own, apart from that of its correlative formal cause."[31] If prime matter is without any actual determination, then it cannot function as a material cause according to Byrne.

Daniel Graham has already noted Byrne's claim that prime matter as a sheer potentiality is ill-suited to be a material cause in (Graham 1987). Graham notes that "if the substratum [of elemental change] is nothing at all, something has come to be out of nothing."[32] He goes on to ask that "[h]ow then Aristotle [can] escape the charge that his elements are created out of nothing," given that Aristotle "shares with the Eleatics an abhorrence of *ex nihilo* creation."[33] It is clear from Graham's above remark that T3 is the main source of his complaint, while the main argument in (Graham 1987) is that there is an irresolvable paradox in Aristotle's treatment of the elemental change. Graham agrees with Byrne that if prime matter is wholly undetermined, then it surely cannot function as the substratum. This is so because the sheer potentiality gives rise to the difficulty that he calls "the paradox of prime matter"[34] in the elemental change. There is yet another intermediate account that agrees with both Byrne and Graham on the implausibility of prime matter as a sheer potentiality.

Dennis Polis, too, agrees with Byrne and Graham in (Polis 1991). He maintains that "[f]rom the logical point of view, the traditional doctrine of *prima materia* makes no sense. How can one have a concept of a

30) Byrne 1995, 201
31) Byrne 1995, 202-3
32) Graham 1987, 477
33) Graham 1987, 477
34) Graham 1987, 477

principle which, by hypothesis, has no intelligibility? If all intelligibility is contained in form, matter must be unintelligible. It cannot, then, serve as a cause. For a cause is a principle of explanation, which is by definition a source of intelligibility."[35] "Hyle is always the dynamics to become some particular thing"[36] that "during natural generation the new form, instead of being intentionally present in the artificer, is potentially present in the matter" in an attempt to bring back the original hyle. Polis takes this last point to show that "hyle is not totally indeterminate, but determined to some specific form."[37] More generally, he thinks that "nothing is properly said to be potentially '*X*' until it has an internal disposition such that, nothing intervening, it will blossom into '*X*'."[38] So Byrne, Graham, and Polis all agree on the untenable nature of T3, while their routes[39] to it were different. All of them nonetheless seem to accept the traditionalist claim that there is a common matter for the sublunary elements.

Byrne says that "[the denial of any material substratum more primitive than the material elements] runs into problems … when it comes time to explain the interaction and substantial change between the elements themselves." This leads him to "agree with the traditional doctrine that these changes require a substratum more primitive than the

35) Polis 1991, 241

36) Polis 1991, 240. He supports the claim by noting that "the difference between physis and natura is the difference between action and passion." According to him, "[s]ince hyle is a definition of physis, its interpretation as a principle of passive potency is suspect" (Polis 1991, 232).

37) Polis 1991, 235

38) Polis 1991, 236

39) Incidentally, Cohen also agrees with them. He says that "Aristotle does posit a common matter for the four elements, but this does not commit him to prime matter. The common matter of the four elements is not prime—that is, it is not bare or characterless" (Cohen 1984, 172).

material elements, one that is common to them all."[40] Graham seems to be in agreement with Byrne on this. Graham thinks that "my argument will provide an incidental justification for it by exhibiting its function within Aristotle's system," while acknowledging that "I shall not defend the existence of a doctrine of prime matter in Aristotle's philosophy."[41] A denial of T3, coupled with an acceptance of the traditionalist account of prime matter (albeit an indirect defense of the account) indicates a willingness to defend T1. Graham does just that, and that fact commits Graham to the common matter interpretation of the elemental change. Polis is ambivalent about the common matter doctrine. This is to be expected because his main concern in (Polis 1991) is not specifically the reciprocal elemental change. A clearer case of accepting the traditionalist account of the common matter is found in (Cohen 1984). He shares Byrne's and Graham's common matter interpretation. Cohen maintains that "Aristotle does posit a common matter for the four elements."[42]

Judging the merit of the intermediate account goes beyond the scope of this paper, but there is a way of obviating the difficult task of evaluating the account. If it can be established that the revisionist has much less trouble in explaining the elemental change than the traditionalist has, then it removes at least part of the motivation for the intermediate account of prime matter. We now turn to the arguments for R2 and for R3 in sections 4 and 5 respectively.

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40) Byrne 1995, 201
41) Graham 1987, 476
42) Cohen 1984, 172

4. The Revisionist Account:
Elemental Changes Without a Common Matter

The revisionist rejection of T2—prime matter underlies the two fundamental contraries: the hot and the cold, the dry and the moist—leads her to R2. It states, recall, that Aristotle can do without a common matter in allowing the elemental changes. This is so because it is possible for each element to "function" as the material cause in the elemental changes. How can we be sure of the possibility? I shall argue that it is possible without positing a common matter for all elements in this section.

Let us begin by reminding ourselves of the following fact: the four sublunary elements are characterized by the two contraries, the hot and the cold, the moist and the dry.[43] These two contraries themselves are not composites. They are rather the characteristics (or, the simple bodies) of the four sublunary elements. Aristotle characterizes the four elements as follows. Earth is characterized by the cold and the dry; water the cold and the moist; air the hot and the moist; and, fire the hot and the dry. The revisionist focuses on this characterization of the element, i.e., the contraries of elements, in her explanation of the elemental changes. The substratum that persists throughout a change is, according to the revisionist, one of the contrary characteristics that are shared by the pair of the elements that are "undergoing" change.

Consider an example. Earth becomes water. The element earth expires itself and instead another element, water, comes into being. Now the revisionist account explains the change by identifying the cold as the substratum on the ground that the cold persists through earth's

43) See *GC.I.319b1*. Cf. ft. 10.

transformation into water, i.e., the cold "functions" as the substratum. The lost in the elemental change (hence, in an elemental transformation) is just a contrary characteristic of the element earth, viz. the dry; and, the gained in the elemental change (hence, in the same elemental transformation) is just another characteristic of the element water, viz. the moist.

The result is that every elemental change is explainable as losing *one* contrary characteristic while gaining *another* contrary characteristic. In other words, this generalized result obtains for all possible pairings of the reciprocal elemental changes. This illustrates how an element can transform into another without there also being a common matter between the two. It is nonetheless important to see if this revisionist explanation of elemental change is consistent with the definition of 'matter' that is given as AM. I shall illustrate that the revisionist account is consistent with AM for the remainder of this section.

AM consists of three distinguishable components:[44] MD, SD, and PD. Consider again the above example of the element earth becoming another element water. The elemental transformation permits the following illustration:

(**EC**) at *t*1: the element earth which "consists of" the cold and the dry[45]
at *t*1+1: the element earth loses the cold, of which it partly consists
at *t*1+2: the cold of the element earth gains the moist, resulting in the element water

44) See the list of abbreviations at the end of this paper.

45) The 'and' is not meant to be read merely as an addition. It is unclear how the 'and' is to be understood. This does not, I think, affect the point that I am making here.

There is a *caveat* to be noted about the above illustration before we explain it. It should not be understood as implying a strict temporal order. This time index serves as a conceptual order. First, then, the element earth is no more as soon as the dry "breaks itself off" from its union with the cold at the earliest stage of the transformation. The element water comes into existence as soon as the cold from the element earth "gets attached to" the moist at the latest stage of the transformation. It then should be noted that the cold acts as the "thing" which persists throughout the transformation. The cold thus functions as the substratum. This satisfies SD of AM.

Second, recall MD. It states that matter is "that out of which a thing comes to be" or "from which [a substance] comes to be."[46] It is clear from the above illustration EC that the element water would not have come into existence, were it not for the cold. The cold in this way satisfies MD of AM as well. For the cold functions as a material cause for the element water.

PD, the third and last component of AM, can be shown to be satisfied in EC above. The cold is obviously not the element water. This fact does not make it impossible for the cold to "become" a contrary characteristic of the element water. The cold "transforms" into the element water when it is joined by (or, when it joins with) an appropriate contrary characteristic of elements. So the cold satisfies PD of AM. All three components of AM, i.e., SD, MD, and PD are then shown to be consistent with the revisionist account of the elemental change without a common matter. For no contrary characteristic is matter in itself; rather, it functions as matter.

It might be objected, nevertheless, that the cold at $t1+1$ of EC

46) See M1 and M2.

appears to be more basic (or, fundamental) than the elements.[47] The revisionist could respond to the possible objection by highlighting the Aristotelian claim that no contrary characteristic is a composite. The cold is thus not a composite. If the cold were to be a composite that is more fundamental than the elements, then there would have to be more than one composite more basic than the elements. The hot and the cold, and the dry and the moist, all of them would turn out to be, if a contrary characteristic were to be a composite in itself, the composites that are more basic than the four elements. Even if the contraries are more basic and more fundamental than the four elements, the traditional claim, T2 still fails to follow from that fact. Again no contrary characteristic is matter in itself.

EC provides a possible way of doing without a common matter. The example of earth transforming into water can be generalized for other possible transformations of elements. The revisionist maintains that (1) the transformations of elements are possible without a common matter for the elements, (2) the contraries and their functions are consistent with the definition of 'matter' in AM, and (3) the more basic nature of the contraries compared to that of the elements, does not force the traditionalist doctrine onto us that there has to be a common matter for there to be the transformations among the four elements.

So the need for a common matter in elemental changes has been shown to be absent. Now what would be an advantage of the revisionist account over the traditionalist one? One of the revisionist advantage is that her account accommodates Aristotle's remark on the non-uniformity of speed among different elemental changes, while the

47) These are the element earth and the element water in EC of which the cold is a characteristic.

traditionalist fails to explain the remark without making his position unstable. This revisionist rejection of the traditionalist account of prime matter, R3, will be defended in the following section.

5. The Revisionist Account:
The Quick Processes and the Slow Processes

R3 states, recall, that the traditionalist account fails to accommodate Aristotle's remark that some elemental change takes more time than other such change. I shall show how the revisionist accommodates the following remark of Aristotle's, and also show how the traditionalist fails to accommodate the remark in this section.

Aristotle says of elemental changes that "the speed with which [elements] come-to-be one out of another is not uniform—since the process of reciprocal transformation is relatively quick between those that tally, but relatively slow between those which do not" (*GC.II.332a35ff*). This remark of the non-uniformity of speed on the elemental change can be straight-forwardly explained on the revisionist account. Here is how the revisionist accommodates it.

Some pairs of elements that could undergo a reciprocal change share a common contrary characteristic, while some other pairs of elements that may undergo the similar change do not. Consider, for instance, the pair of the element earth and the element air. The element earth "consists of" the cold and the dry, and the element air "consists of" the hot and the moist. Clearly earth and air share no common contrary characteristic. Yet the pair of the element earth and the element water share the cold in common. So the revisionist may help herself with the explanation that identifies what Aristotle calls "[the elements] that tally"

as any pair of the elements that share a common contrary. Any pair of the elements that do not share a common contrary may be identified as "[the elements] which do not [tally]" (*GC.II.332a35ff*) in a similar manner as well. Let us see how these identifications help the revisionist to account for the non-uniformity of speed among different elemental changes.

For the element earth to transform into the element air, there has to be something that persists throughout the change. This is the substratum thesis. The element earth and the element air do not share a common characteristic that can serve as matter for the transformation. This lack of shared contrary characteristic requires the transformation of the element earth into *some* element that shares a characteristic with it. The element earth shares the cold with the element water, and it shares the dry with the element fire. So the transformation of earth into air requires an intermediate transformation that is *quicker* than other transformations, i.e., either into the element water, or into the element fire.[48] The elemental transformation from earth into air *via* water above permits the following illustration:

(**EC'**) at *t*1: which "consists of" the cold and the dry
at *t*1+1: the element earth loses the cold, of which it partly consists
at *t*1+2: the cold of the element earth gains the moist, resulting in the element water

48) An immediate question can be raised about the procedure/process within which the route gets determined between, in this particular example, the two possible transformations. It is an interesting question, but lacking an answer to the question does not affect the nature of the revisionist way of accommodating the time difference.

at $t1+3$: the element water loses the moist, of which it partly consists
at $t1+4$: the moist of the element water gains the hot, resulting in the element air

Again the same *caveat* applies to EC' just as to EC. The time index serves merely as a conceptual order. Now the first intermediate transformation poses no problem for the final transformation. The final elemental change works straightforwardly. In fact, every intermediate transformation works just the same as was illustrated in EC above. EC' illustrates that the element earth reciprocally changes itself into the element air in two different steps: the change takes either the route of earth-water-air as is illustrated in EC' (or, via the route of earth-fire-air). So the revisionist accommodates Aristotle's remark with which this section began about the non-uniform speed among different elemental changes as follows: some reciprocal change between elements are of EC type, and some other reciprocal changes between elements are of EC' type. Some transformations require no intermediate step, while other such transformations of elements do require an intermediate step of quick kind. This revisionist accommodation of the remark certainly adds to the plausibility of the account. Furthermore, this would be proved to be a clear advantage over the traditionalist account if it can be shown that neither EC nor EC' is available for the traditionalist. I shall try to show that in the remainder of the section.

One of the traditionalist doctrines, T2 states that prime matter is that which underlies the two fundamental contraries—the hot and the cold, and the dry and the moist. So the traditionalist maintains that there is one and the same ultimate material cause for every possible transformation of elements. The traditionalist account of elemental

transformation renders the following illustration à la EC and EC' above.

(**TEC**) at *t*1: the element earth which “consists of” the cold and the dry shares a common material cause with the rest of the elements
at *t*1+1: prime matter that is shared by every element
at *t*1+2: the element water which “consists of” the cold and the moist shares a common material cause with the rest of the elements

The commonly shared matter, i.e., prime matter on the traditionalist account, satisfies all three of AM’s definitions of matter. This is apparent from PM above. Prime matter functions as the material substratum. That is, prime matter is that which facilitates others to change, but does not itself change. It is more crucially that which potentially persists through all possible cases of the reciprocal transformations of elements. It appears, then, that there is no room for an intermediate step within TEC. If prime matter persists without the possibility of modifying itself, then it cannot be “constituted” by different contraries of elements. The contraries are not the characteristics that “make up” prime matter, according to the traditionalist. Instead, prime matter’s existence and/or its subsistence throughout the elemental change is what makes the existence of the contraries possible. In other words, prime matter is the substratum for the contraries on the traditionalist account. Thus, the revisionist account that allows for the speed difference between the slow reciprocal transformations of elements and the quick reciprocal transformation of elements is unavailable on the traditionalist account. Furthermore, the traditionalist cannot help himself with the explanation that is analogous to the discussed difference between EC and EC' because of his earlier commitment to

prime matter as a sheer potentiality.

It might be objected that prime matter may be allowed to take different contraries depending on the elements that it allows to be changed. This objection either renders the traditionalist account inconsistent, or it leaves mysterious the elemental changes. To say that prime matter takes on different contraries on different occasions, on the one hand, goes against T3. It states that prime matter is a sheer potentiality. No sheer potentiality can remain a potentiality if it takes in different contrary characteristics on different occasions.[49] To say that prime matter takes on different contraries, on the other hand, merely pushes back the question about how the non-uniformity of speed could be accounted for. How prime matter takes on different contrary characteristics of elements has to be explained; and, given prime matter as a sheer potentiality as in T3, no such explanation is forthcoming from the traditionalist camp.

It is illustrated in sections 4 and 5 that (1) the notion of prime matter is *not* required for Aristotle to allow the reciprocal transformational changes among elements, and (2) the traditionalist has no recourse to accommodate the difference between the quick elemental transformations and the slow elemental transformations, while the revisionist can explain the remark straightforwardly.

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49) The traditionalist may, I take it, choose to reject his notion of prime matter as a sheer potentiality. Nonetheless, the theoretical cost has to be weighed against the consistency of the resulting traditionalist account of prime matter. I am skeptical of its merit, especially given the traditionalist role that it allegedly fulfills, but the pursuit for this traditionalist rejoinder lies beyond the scope of this paper.

6. Concluding Remarks

The traditionalist account, the intermediate account, and the revisionist account of prime matter have been presented and discussed in this paper. It is noted initially that the sheer potentiality doctrine of prime matter, which is identified as a traditionalist doctrine has recently come under new attack. The main source of the criticism is that if prime matter were to lack actual determination whatsoever, then it would fall short of playing the role that the traditionalist assigns it to fulfill. These all point to Aristotle's concept of potentiality as some determinate "thing." The intermediate account gives support for the criticism. Nonetheless, the intermediate account somehow agrees with the traditionalist account that there has to be a common matter for elemental transformations. I argue that the common matter doctrine of prime matter, which is shared by the traditionalist account and the intermediate account, is not required. EC and EC', on the one hand, illustrate the possibility of elemental changes without a common matter. The common matter doctrine, on the other hand, goes against one of Aristotle's remarks about the non-uniformity of speed among different reciprocal elemental transformations.

I shall register a further research plan along the account that is given here. While it is reasonable to maintain that there is no need for Aristotle to posit (and, thereby perhaps does not posit) prime matter as the common matter, the revisionist account is not without fault. Most noticeable is the nature of the contraries when they have lost the corresponding pair contrary. Any one of the contraries, it is unclear how it can be described when it is broken off from its pair contrary. For instance, the cold at $t1+1$ in EC or in EC' seems thus unexplainable.

Another one has already been mentioned above. While EC' allows the revisionist to account for the difference between the quick elemental transformations and the slow ones, the account leaves the determination of the route unexplained for the intermediate step that a slower elemental transformation may take. Thus, the revisionist must seek further to explain how such a determination is made in claiming the complete "superiority" over the traditionalist account of prime matter.

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List of Abbreviations

AM Definition of (Aristotle's) matter
C Text on 'change'
EC Example of elemental change
M Text on 'matter'
MD Material definition of 'matter'
PD Potentiality definition of 'matter'
PM Definition of 'prime matter'
R Item of the revisionist dismissal of the traditionalist account of prime matter
SD Substratum definition of 'matter'
T Item of the traditionalist account of 'prime matter'
TEC Traditional example of the elemental changes

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The Reciprocal Transformations of Elements:
The Quick and the Slow

Shin Kim

In this paper, I argue for the revisionist account of prime matter, according to which Aristotle's metaphysics does not require the common matter in allowing the reciprocal transformations of elements. First, 'matter' in Aristotle's work is analyzed into three distinguishable definitions: the material definition, the substratum definition, and the potentiality definition. Second, the traditionalist account of prime matter is shown to satisfy all three definitions. It is then pointed out that the traditionalist notion of a sheer potentiality is unintelligible. This is shown with the help from the recent intermediate account of prime matter. Third, I argue for the revisionist account of prime matter on two grounds. Section 4 establishes that Aristotle can do without prime matter in allowing the elemental changes. And, more importantly, it is argued in section 5 that the traditionalist account fails to accommodate Aristotle's remark that some elemental changes take more time than other such changes, while the revisionist can easily account for the remark. This paper concludes with a thought, acknowledging a couple of further research tasks in completing the revisionist account of prime matter.

Key Words: Aristotle, Prime Matter, Change, Elements

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