

Comments on J. Hayes

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Abstract

In his paper, Josh Hayes argues that inclination (ῥοπή) is the nature of each element. It is an active and passive principle that explains why the elements move to their proper places. Thus, according to Hayes, by introducing inclination in *De Caelo* IV.1, Aristotle posits a single explanatory factor that accounts for all elemental motions. Doing so, he answers the question, posed in *Physics* VIII.4, of what the cause of elemental motion is. In my comments, I will contest these claims. Aristotle's theory of elemental motion does not rely on a single explanatory factor; yet, it is not, as Hayes claims, incoherent. Instead, the different strands merely reflect the special nature of the elements.

Keywords Aristotle, Nature, Elements, Place, Motion

I

Aristotle defines nature (φύσις) as a principle of motion and rest. As a principle, it is the explanatory factor that controls and explains natural motions. Fire moves upward in virtue of *its* nature, while earth moves downward in virtue of *its* nature. Aristotle contrasts natural motion with forced motion (βίη). Since a forced motion is contrary to nature, we must explain it. A stone moving *upward* moves contrary to its nature, and we will explain it by mentioning a mover that moves the rock, e.g., a person throwing it. Moving downward, by contrast, is just what stones do.

Is there more to say? Josh Hayes gives a more complex and sophisticated response. His intriguing paper brings out conceptual and explanatory relations that go far beyond the simple answer and thus helps us see Aristotle's theory as a well-motivated

piece of philosophical reasoning, not as simple-minded assertions about what things naturally do. He posits a single explanatory factor—an element’s inclination (ροπή)—that explains the motions of the elements. His argument is this:

1. Nature is both an active and passive principle, both of moving and being moved.
2. The nature of an element is its inclination.
3. Inclination is an active principle because it is the activity (ἐνέργεια) of the element enacting and maintaining its own end (ἐντελέχεια) by being at rest in its proper place.
4. Inclination is also a passive principle because it is the passivity of the element to be moved to its proper place by another element insofar as the respective element undergoes generation or substantial change.

In a further step, Hayes connects this account of inclination with *Physics* VIII.4, where Aristotle holds that whatever is in motion is moved by something. According to Hayes, inclination (ροπή) is the mover of the elements. In this way, Hayes presents an overarching interpretation of Aristotle’s natural philosophy according to which inclination is the nature, both active and passive, of an element and is also the mover according to *Physics* VIII.4. Understanding Aristotle's theory along those lines will secure “the internal coherence of Aristotle's natural philosophy” (p.7). If Hayes is right, and inclination is *the* central notion of Aristotle's elemental theory, his paper would significantly improve our understanding of Aristotle's theory.

I agree with Hayes that the explanatory buck does not stop with the truism that stones fall downward. However, I will contest the role of inclination and that there is a single explanatory factor. First, the inclination is a second actuality and, therefore, cannot be an element's nature. Second, an element's nature does not cause its motion; the cause is what removes the obstruction. Nor does an element have a principle of rest in that it naturally comes to rest in its proper place. Third, although an element's nature explains why it can change into another element, this nature cannot account for the subsequent motion to the proper place. Fourth, the place, not an inner principle, ultimately accounts for the motion to and rest at an element's proper. Thus, Aristotle's theory of elemental motion does not rely on a single explanatory factor; yet, it is not, as Hayes claims, incoherent. Instead, the different strands merely reflect the peculiar nature of the elements.

II

Since claim (1) that nature is a principle of motion and rest is axiomatic, let us begin with (2) and ask how inclination relates to an element's nature. As natural bodies, the elements move naturally (*κατὰ φύσιν*) and in virtue of themselves (*καθ' αὐτό*) towards their respective places and do so in virtue of being heavy or light. Earth, e.g., is heavy, which explains why it moves downward.¹ This is a standard view, I believe.

¹I gloss over the complication of whether being heavy is part of the essence of earth or whether it is not a part of the essence but a property that follows from its nature. But for present purposes, this distinction does not matter much because my comments apply to both versions.

What role does inclination play here? Since we can define ‘being heavy’ as ‘being inclined to move downward’ (cf. *Metaph.* 1052b22-29), inclination is part of what it is to be heavy or light. However, it cannot be the entire explanation because inclination, in itself, is neutral concerning the direction of movement. The heavy and light, by contrast, are conceptually linked to places. To be heavy is to move downward (*Phys.* VIII.4 255a15-17). Thus, Hayes might be correct that inclination is a part of an element’s nature. Yet, this falls short of his more ambitious project because, according to this minimal view, inclination is part of the notions of heavy and light that figure in the standard view.

Identifying inclination with an element’s nature also poses a conceptual difficulty. Nature is a first actuality, and Aristotle also defines being heavy or light as a disposition for moving in a certain way (*Cael.* IV.1 307b31-32). However, in this passage, Aristotle clarifies that inclination is the activity or actuality of this disposition. (More precisely, he says that the activities do not have a name, “unless someone thought that ‘inclination’ is such a name.” The wording is undoubtedly surprising if inclination were a fundamental notion.) But if we understand inclination as the *activity* of the heavy and light, it cannot be nature. A stone that I hold up is heavy and possesses its nature, i.e., its disposition to move downward. Still, it does not exhibit the corresponding activity; it does not incline.²

² In general, it seems that inclination designates a tendency to move, a certain momentum. Aristotle seems to use inclination in this sense in the *Mechanics*. If so, the earth resting at the center is heavy but has no inclination (contrary to Hayes’s claims at p.11).

III

But let us accept that inclination is connected to the nature of the elements. Hayes argues that since nature is a principle of motion and rest, and inclination is an element's nature, inclination is a principle of motion and rest. This inference seems straightforward, but it is not. First, accepting that inclination is a principle of motion, is it also a principle of *rest*? Earth's nature explains why it moves downward. Does earth's nature also explain why it stops? Or is it that earth moves downward until it can go no further? If I let a stone fall, it rests because other stones are already there. If I dug a hole, it would fall further. One might note that *De Caelo* IV.5 312b3-10 suggests that water would occupy the center if one were to remove the earth, even though the proper place of water is distinct from that of earth.³ This suggests that a heavy element moves downward until it cannot go further, not until it has reached its proper place. However, if an element's nature were a principle of rest, one would expect that it controls and ends the motion once the element has reached its proper place. Yet, this is not the case.

We can make this point more precise by considering the position of Sheldon M. Cohen. Cohen holds, apparently contrary to my view, that elements do not have a principle of motion but only of rest: "What is natural to earth is not motion, but rest: to be, to

³ A further difficulty is that the ultimate downward place is the center of the universe, a geometrical point. Since no extended parcel of earth can occupy this point, earth apparently never completely actualizes its natural resting position.

stay, to remain in a certain place, i.e., down - not movement toward that place. The actualization of the heavy is not to move toward the center, but to be at the center” (Cohen 1994, 158). I take the idea to be that the nature of, e.g., earth is a principle of rest because it explains why earth rests at the center. Since it is natural for an element to be in its proper place, and natures are explanatory principles for Aristotle, this will be the ultimate explanation of why the earth is at the center. I consider my view to be compatible with the position so stated. However, it does not follow that the elements have a principle of rest in the sense that they *stop* moving once they occupy their proper place. This inference is precisely what I deny and what Hayes and Cohen assume.⁴ It is one thing to say that an element is naturally at rest at its proper place, it is quite another to maintain that the element, when in motion, would naturally stop there. As the passage from the *De Caelo* shows, Aristotle does not hold the latter. He does, however, hold the former. For as I will argue in section V, places are partial formal causes, that is, what it is for something to be *this* kind of element is partly defined by its proper place, i.e., the place where it is naturally at rest.⁵

⁴ Cohen 1996, 43: “Similarly, when the elements reach their natural places, their motions cease naturally.”

⁵ What about Cohen’s claim that the elements have no principle of motion *at all*? This question is difficult to answer. Since water would continue move downward if earth were to be removed, the motions of the elements cannot be reduced to their disposition to be at their proper place. Yet, as I am going to suggest in the next paragraph and section V, I think that Cohen is right when he denies that the elements have an *inner* principle of motion. As we will see, what ultimately explains the motion of an element is its place, which is not an inner principle.

Second, is an element's nature—the inclination, according to Hayes— a principle of motion? It is natural for the earth to move down and fire to move up. However, to ascertain whether they have a principle of motion, we must understand what a principle of motion is. Self-movers, like animals, have a principle of motion in that they initiate and cause their movement. The elements, however, are not self-movers (*Phys.* 255b29). They do not cause their motions in the relevant way.

For this reason, Aristotle says that the elements have “a principle of movement, not of causing movement or of affecting, but of being affected” (*Phys.* VIII.4 255b30-31). Earth does not have an inner principle that *causes* it to fall downward, but whatever causes the earth to move is external. Earth's inner principle, thus, only determines that falling (intransitive!) downward is natural for the earth because it is toward its proper place. Therefore, contrary to Hayes, the elements do not cause their motion, and they do not have a principle of motion in the required sense.

These remarks touch on a broader issue that Hayes does not address in its paper. When Aristotle defines in *Physics* II.1 192b13-14 nature as an inner principle of motion and rest, does he commit himself to the view that everything has its nature in the same way and completely? Hayes does not say it explicitly, but he seems committed to the view. By contrast, I do not think this is the case. Elements have a nature, and their motions are natural. Yet, the way the elements have a principle of motion and rest differs from the way animals have a principle of motion and rest. Animals are self-movers, that is, they are the *efficient* causes of their movements, but the elements are not. Thus, ascribing a principle of motion and rest to the elements

differs from ascribing it to animals, and modeling the nature of the elements on that of animals, as Hayes appears to do, will not work. So *if* the definition of nature in *Physics* II.2 implies that natural things are the efficient causes of their motion, the nature of elements is incomplete and lacks aspects of an animal's nature.⁶

This difference between Hayes's and my interpretation is borne out by how we understand *Physics* VIII.4, respectively. According to *Physics* VIII.4, everything moved is moved by something. Things that are moved contrary to their nature have an external mover; for example, a person throwing a stone in the air is an external mover of it. Self-movers are internally complex such that one part moves another part. Since a stone's downward motion does not seem to fit either model, what is the mover of the elements? Hayes's remarks on [p.9-10](#) suggest that he believes the element's inclination to be the mover of the element.⁷ I want to offer a different reading of *Physics* VIII.4.

⁶ That is a big *if*, though. Kelsey 2003 argues that the definition of nature in *Physics* II.1 does not imply that natural things are the efficient causes of their own movement; instead, having a nature is having a certain authority of one's motions by the proper subjects of them. If this is correct, elements and animals have a nature in the same sense. However, my main point still stands because, on either conception, it is mistaken to model the way the elements move on the way animals move.

⁷ Cf. on [page 10](#): "In contrast to the actualization of the first-level potentiality as a change (*μεταβολή*) requiring an external efficient cause to determine the transition from one contrary to another, Aristotle's example of the second-level potentiality, i.e. the capacity to exercise knowledge, is analogous to the elements actualizing themselves insofar as the nature of each element is defined by its active principle of motion expressing what the element is by being at rest in its proper place, 'In regards, to the natural bodies, also the case is similar, for the cold which is potentially hot, when it has completed the change and is effectively fire, actualizes its new potentiality and burns things, if not prevented' (*Phys.* VIII.4 255b6-8). Therefore, inclination as the nature of each element is akin to those capacities of the soul which are activated when they encounter something through perception, thought, desire,

Something potentially heavy (first actuality) will indeed actualize this potentiality and move to its place *if nothing hinders*. But Aristotle's point in *Physics* VIII.4, as I understand it, is not that the nature of the elements is, therefore, the mover. Instead, the mover is what removes the obstruction. What moves the stone downward is that I let it go. Thus, the elements are not self-movers "even in the broader sense of being effected by the exercise of capacities belonging to its subject" (Kelsey 2003, 61 fn. 4).

I think this becomes reasonably clear from the following passages:

And the one who removes what supports or prevents in a way causes movement and in a way does not—for example, the one who pulls away a supporting pillar or removes a stone from a wineskin in the water. For he moves the thing coincidentally, just as the ball that bounced back was moved not by the wall but by the thrower. It is clear, therefore, that none of these things moves itself. However, each does have a starting-point of movement, not of causing movement or of affecting, but of being affected. (*Phys.* VIII.4 255b24-31)

If, then, all things that are in movement are moved either by nature or contrary to nature and by force, and if things moved by force and contrary to nature are all moved by something, and something other

or nutrition. For example, fire acts according to the same principle by taking on its active condition by engaging in the activity of burning when it encounters something combustible."

than themselves, and if, in turn, things moved by nature are moved by something, both those moved by themselves and those not moved by themselves (for example, the light and the heavy— for they are moved either by what caused them to come to be and made them light or heavy, or by what removed the thing that was impeding or preventing), then all things that are in movement are moved by something. (*Phys.* VIII.4 255b31-a2)

Thus, while it is undoubtedly true that earth moves downward because it is heavy, the puzzle of VIII.4, as I read it, is that this answer *prima facie* conflicts with the claim that everything is moved by something. Since elements are not self-movers (255a5-6) but still move naturally to their respective places, we apparently cannot point to either an internal or an external mover. Thus, their natural motion is part of the puzzle, not the answer. Aristotle responds by pointing out that the elements are moved by something because the one who removes the obstruction is a mover. Thus, he can conclude that everything is moved by something.

For this reason, the mover of the stone's motion must be my letting it go and not the stone's nature. Yet, it is significant that I only accidentally move the stone because this allows Aristotle to distinguish it from a forced motion. The element's nature, not what removes the obstruction, determines the character of the resulting motion (up or down). Or perhaps, better, what counts as removing an obstruction is determined

by the element.⁸ I remove an obstruction to a stone's downward fall only if the stone has a pre-existing tendency to fall downward. Therefore, an element's nature figures in explaining the motion in a way it does not in forced motions. I will return to this below.

IV

I think a similar question arises about the claim (4) concerning the transition from something's being potentially light (first potentially) to its being dispositionally light (first actuality). The transition's cause is not the nature of the element but what caused it to become dispositionally light. For example, water is potentially light and, for this reason, 'water is the matter of air, which is, as it were, the actuality of water' (*Phys.* IV.5 213a2-3). If water becomes air, it *is* light, and it will rise. Since water is potentially air, this is not a forced motion:

When fire and earth, then, are by force moved by something, they move contrary to nature, but they do so by nature when they are engaged in the activities that, in potentiality, are their own. (*Phys.* VIII.4 255a28-30)

Hence, water's changing into air and rising up is a natural motion for water. The mover, however, is not water's nature. Instead, the mover

⁸ On this, see Waterlow 1982, 167–8.

is whatever causes it to become air. I am unsure whether Hayes disagrees with this, and I hope I did not misconstrue his claims. But it would be helpful to spell out how inclination, as a passive principle, relates to the question *Physics* VIII.4.

Irrespective of this question, I want to direct the attention to the following sentence that is crucial for Hayes's interpretation: "Inclination is identified with the passivity of the element to be moved to its proper place by another element insofar as the respective element undergoes generation or substantial change" (p.7). The sentence explains how inclination is a passive principle of motion to an element's proper place. An instance of this sentence is: "The inclination is water's passive capacity to be moved to its natural place by another element, e.g., by fire, insofar as water changes to air." But this cannot be correct because the relevant inclination is not water's inclination (the referent of 'its') to move down but air's inclination to move up. Substantial generation—the transition from first potentiality to first actuality—and the subsequent motion to the proper place is, to use Hayes's terminology, not due to the inclination of the element that undergoes the generation. Instead, substantial generation is how something gains a different inclination or nature. What has a first potentiality "does not yet have its nature before it acquires the form" (*Phys.* II.1 193b1). Water is potentially light in that it can change to air. But before this change, neither it nor the air, which does not yet exist, is light. Thus, in explaining how some air that has formerly been water has moved up, we need to mention *two* natures. The nature of water explains why it is potentially light and why it has the passive capacity

to be transformed into air by, e.g., fire. Once the air has been generated, the nature of air explains why it moves upward if nothing impedes it.

Therefore, while it is true that water's passive capacity to be turned into air explains why the whole process is according to nature, we cannot account for it terms of water's nature alone. Instead, an external mover that transforms water into air must be present, and if necessary, something removing what obstructs the generated air's upward movement. Finally, air moves upward because of its nature; a nature that the water had only potentially because it could be transformed into air.

V

In closing, let me return to the question of how the heavy and light relate to their respective places. I have argued that within the context of *Physics* VIII.4, Aristotle is interested in the role of triggering causes as movers. The triggering cause moves in a way and a way not. I suggest Aristotle elaborates in *de Caelo* IV on why triggering causes are not movers *tout court* by explaining how elements move towards their proper places.

In some passages, Aristotle appears to give a deflationary answer:

The activity of the light is being in a certain place and up but when it is in the contrary place, it is hindered (*Phys.* VIII.4 255b11-12).

Unless the light is impeded in its motion, it will naturally move upward. Seeking a *further* explanation of this means one has not understood what being light is. What it is to be light is defined by being up (*Phys.* VIII.4 255b13-17). Yet, this deflationary answer leaves it open whether the place has explanatory power. True enough, being light is being up. But where does the ultimate explanation lie? In an inner principle or the place, which is the form of the light (*Cael.* IV.3 310a34)? *Prima facie*, these are competing answers, and I am unsure which explanation Hayes favors. On the one hand, he emphasizes the inner capacity of the element;⁹ on the other, he also takes seriously the idea that place has some power. But if I understand it correctly, he reduces the power of place to the (qualitative) form of the element.¹⁰ So I will (tentatively) ascribe the first answer to Hayes.

The main reason for choosing the second answer is the explanatory asymmetry between the places and the elements because elements are defined by their places, but not *vice versa*. The center and outer sphere of the universe determine up and

⁹ Since the nature of each element is not exclusively defined by its passive principle of motion, i.e., being moved and hence generated by a neighboring element moving it to its proper place, but by the active principle of motion whereby the element becomes fully actualized by being at rest in its proper place, the cause of passivity and activity must be attributed to an inner capacity of the element to exercise its form qua heaviness or lightness. (p.14)

¹⁰ Cf: “If the motion of each body to its proper place is primarily the actualization of that which is potential, then form is no longer to be identified with a cause. Instead, we shall conclude that for the element to be in its proper place is merely to have activated its potential by *being* in that place. Hence, the element attains its actuality only by actively being at rest in its proper place. To say that a place has a certain kind of power might therefore imply “the place of actualization” (p.13). Similarly, Algra is mentioned approvingly in fn. 65, and his view is also that the place is not the form, but the elements *being* in the place is the form.

down, and by implication, the heavy and light.¹¹ Hence, when Aristotle states that the place is the *form* of the element (*Cael.* IV.3 310a34), we might take this literally.¹² Earth, e.g., is defined as that which rests at the center (*Cael.* II.3 286a20-21), and the center is (part of) the form of earth. This form explains why the earth moves towards the center. Since everything has the potential to actualize its form, the earth's movement is ultimately explained by the center of the universe. If this is correct, the principle that explains the motion of the elements is not an inner principle; instead, it is the place towards which they move. Mary Louise Gill puts it well: “Because the elements are simple, they behave like self-movers without needing an internal active principle. Once some earth has been generated, it automatically moves toward the center if unimpeded. What serves as its active principle is the place itself, which controls and terminates its motion” (Gill 2009, 157). This account does not imply that the deflationary answer or an answer that relies on the intrinsic features of the earth is wrong. But it implies that the ultimate explanation rests on facts about the universe and its places.

Bibliography

Cohen, S M. 1994. “Aristotle on Elemental Motion”. *Phronesis* 39.2, 150–159.

¹¹ *Cael.* I.2 268b21-22; I.3 269b23-24; IV.1 30821-24. *Phys.* IV.4211a3-6 might suggest otherwise, though.

¹² Cf. Morison 2002, 51. Of course, the place is only a partial formal cause because it does not exhaust the form of the element.

- Cohen, S M. 1996. *Aristotle on Nature and Incomplete Substance*. Cambridge.
- Gill, M L. 2009. "The Theory of the Elements in de Caelo 3and4". In *New Perspectives on Aristotle's de Caelo*. Eds. A.C. Bowen and C. Wildberg. 139.
- Kelsey, S. 2003. "Aristotle's Definition of Nature". *Oxford Studies in Ancient Philosophy* 25, 59–87.
- Morison, B. 2002. *On Location. Aristotle's Concept of Place*. Oxford.
- Waterlow, S. 1982. *Nature, Change, and Agency in Aristotle's Physics: A philosophical study*. Oxford.
<https://oxford.universitypressscholarship.com/10.1093/acprof:oso/9780198246534.001.0001/acprof-9780198246534>.