The Aristotelian
Problemata Physica

Philosophical and Scientific Investigations

Edited by

Robert Mayhew
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1 Introduction

The title of Problems 14 is “as many [problems] as are about mixtures” (ὅσα περὶ κράσεις). The “mixtures” (kraseis) in the title refers primarily to the blends of material elements—and their properties of hot or cold, dry or wet—that characterize the environment,1 but the term is also used to refer to the material blend that underlies the bodily features and temperaments of people in these chapters. In fact, the bulk of the problems collected in this book pertain to the causal interaction between the mixture of the environment and the mixture underlying the material properties of the peoples living in that environment, which result in differences of the more and the less in their character traits (chs. 1, 8, 15, and 16), their “ethnic” bodily features (4, 8, and 14), and their health, longevity, and other medical properties (3, 5–7, and 9–12).2

From the very start, the Greeks’ treatment of barbarians involved the development of ethnic “stereotypes,” whereby specific kinds of bodily features as well as particular sets of character traits are assumed to be characteristic of certain ethnic groups. These stereotypes figure prominently in the literature of this period, and also make their appearance in the many up and coming (pseudo-)sciences of that time, such as medicine and physiognomy.3 The idea that these bodily features and character traits are influenced—or even determined—by the particular material properties of the environments in which these ethnic groups live is also fairly widespread in the Classical Greek world, although some thinkers favor the influence of laws and conventions (nomos) over nature (phusis) in the shaping of human body and character. Among our

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1 Hence the traditional translation of the title: “Problems concerned with Climate.”
2 The two remaining chapters deal with environmental problems that are of human interest but do not involve human properties: Pr. 14.2 concerns the “longevity” of grain left out in the cold in the Pontus and 14.13 discusses the phenomenon of extreme stifling heat in wintry regions.
most prominent “scientific” sources for these ethnographical views and the
debate about the role of law versus nature are the Hippocratic Airs, Waters,
Places, Herodotus’ Histories, Plato (especially his Menexenus, Timaeus, and
Laws), and Aristotle (especially his Politics and Generation of Animals).4
Building on these sources for comparative material, this paper will offer an
analysis of the ethnographical chapters in Pr. 14 (i.e., 1, 4, 8, 14–16),5 while pay-
ing due attention to the philosophical and scientific context in which these
theories were being developed. In particular, I aim to show that the kind of
“environmental determinism” concerning body and character that surfaces in
Pr. 14 is broadly Aristotelian in nature. By “broadly Aristotelian” I mean that the
kinds of cultural prejudice they express as well as the kinds of causal explana-
tions that are being offered are for the most part more consistent with views
provided in Aristotle’s treatises than with those found in any of the other con-
temporary (extant) ethnographical treatises.

Before turning to these chapters, however, let me briefly present my take on
the Problems as a whole, as these assumptions will form the backdrop for my
discussion of Pr. 14. First, I believe that many of the problems collected in this
treatise go back to Aristotle or that they are at least Aristotelian in origin, with
later students of the Peripatos adding or changing or even removing some of
the original problems. The way in which Aristotle refers to a treatise with the
title Problems in his own works suggests (to me) that the problems constitute a
“left-over” category of materials that deal with very specific, low-level phenom-
ena that do not fit with the “for the most part”-type explanations that Aristotle
is mostly concerned with providing in his natural treatises. Second, I believe
that it is because of their specificity and low-levelness (cf. Mete. 2.6.363a24–25:
ἐν τοῖς προβλήμασιν εἰρῆσθαι τοῖς κατὰ μέρος) of the phenomena that their expla-
nations refer almost exclusively to material-efficient causes. The materials that
are discussed in the Problems are thus similar in nature to those discussed in
Aristotle’s Generation of Animals book 5: they concern phenomena—such as
differences of the more and the less6 that occur at the sub-species level—that

4 For the most current overview of ethnographical theories in the ancient world, see Sassi (2001,
82–139). For ethnography in the Hippocratics, see Jouanna (1999, 210–32); on Herodotus, see
Thomas (2000, 102–34); and on Plato, see Kamtekar (2002). I discuss Aristotle’s ethnographi-
cal views in Leunissen (2012).
5 The medical problems in Pr. 14 are outside of the scope of this paper, but for the combination
of medical and enthnographical materials in one unit, see also the Hippocratic Airs Waters
Places.
6 On differences of the more and the less, see H.A 1.1.486a25–b8; H.A 8.1.588a18–b3; Pa 1.4.644a16–
21 and b8–15; and Metaph. H.2.1042b29–35; Lennox (2001a, 160–81). On the type of explana-
tions offered for these differences in GA 5, see Leunissen & Gotthelf (2010).
fall below the level of Aristotle’s general laws of nature, and therefore (at least for the most part) do not require teleological explanations. (In other words, I take the rareness of teleological explanations in the Problems to be an indication of the kind of natural phenomena this treatise is dealing with, rather than as a sign that the collection must belong to the period after Strato). And finally, as is the case in Aristotle’s GA 5, the Problems also seems to focus on issues that are particularly relevant for human practices or concerns (the number of problems that deal with human medical issues, with foods and drinks, with human virtues, and human facial features is striking to me), which might explain the continued interest in the use, preservation, and modification of this collection.

In the sections below, I discuss the following three aspects of the ethnographical materials in Pr. 14 and show that they are especially endebted to Aristotle’s views about and explanations of ethnic differences: (1) their tripartite division of the world; (2) their use of “mixture” to refer both to the elemental blend of the environment and to that of people and their ethnic characteristics; and (3) the kinds of causal explanations offered for how these two mixtures interact.

2 A Tripartite Map of the World

The “map of the world” that can be extracted from the ethnographical chapters in Pr. 14 is, as I will argue, roughly Aristotelian in nature. As far as the evidence goes, the only ethnic groups that are mentioned by name in these chapters are the Ethiopians and Egyptians (in Pr. 14.4.909a27: οἱ Αἰθίοπες καὶ οἱ Αἰγύπτιοι) who are said to live in a hot region. The other chapters appear to divide the world into an (excessively) cold and an (excessively) hot region, with a possible third region that is characterized by “the best [environmental] mixture” (Pr. 14.1.909a15: η… ἄριστη κρᾶσις) and that is presumably found “around us” (Pr. 14.8.909b22: οἱ δὲ περὶ ἡμᾶς). Although there is no indication that these hot and cold regions are supposed to be continuous or that they belong to one part of the world only, I believe that the consistent association of hot regions with cowardice and wisdom and of cold regions with courage and a kind of drunkenness of mind (Pr. 14.8.909b9–10; 15.910a26–27; and 16.910a38–39) paints a picture that is remarkably similar to Aristotle’s infamous ethnographical passage in the Politics that describes the personality and intellectual traits of the various people of the world (7.7.1327b18–38):

About the number of citizens, we have spoken earlier about what should be their limit; let us now speak about what should be their natural qualities. One could almost grasp this by looking at the cities that are held in
high esteem among the Greeks and, with respect to the whole inhabited world, at how it is divided into nations. Those nations that live in cold regions and the ones around Europe are full of spirit, but are lacking in intelligence and technical skill, and therefore they retain more freedom, but are without political organization and are incapable of ruling over their neighbors. The nations around Asia have intelligent and technically skillful souls, but are spiritless, and therefore retain a state of subjection and slavery. The class of the Greeks, just as it is located in between them, so too it participates in both [characters]. For it is both endowed with spirit and intelligent, and therefore it retains both freedom and is the best politically organized and is capable of ruling everyone, if formed into one state. The same differentiation also belongs to the Greek nations amongst each other: for some have a one-sided nature, whereas others are well-mixed with regard to both those capacities (τὰ μὲν γὰρ ἔχει τὴν φύσιν μονόκωλον, τὰ δὲ εὖ κέκραται πρὸς ἀμφοτέρας τὰς δυνάμεις ταύτας). And at this point it is clear that it is necessary for those who are likely to be the most easily led to virtue by the lawgiver to be intelligent and high-spirited in nature.7

The passage is rather complex, but what is important for our current purposes is that Aristotle here expresses the view—which he takes to be shared by his audience—that the world roughly consists of three climatic regions and that the people that live in each of these regions have distinct character profiles (which lead to distinct types of political organization). There is a cold region, mostly identified as Europe, where people are spirited but stupid;8 a region identified as Asia, where people are cowardly but intelligent, and which is presumably hot (as it is the opposite from Europe); and, finally, an intermediate region where the Greeks live and where at least some people are “well-mixed” and hence courageous and intelligent (because of this, moral development will be easier for this latter group).9 We also know from other texts that Aristotle locates Europe towards the north and Asia towards the south (Mete. 1.13.350a18–b18),10 and that he characterizes regions in Europe as not only cold

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7 All translations are my own.
8 Cf. also EN 3.8.115b25–30 on Aristotle’s characterization of the Celts as madmen and as fearing nothing, with Pr. 15.3.91a1–4 on the stupidity of the Thracians (both peoples live in the cold parts of Europe).
9 On this passage and its significance for Aristotle’s ethnographical views, see further Leunissen (2012).
10 However, sometimes Aristotle divides the world into Asia, Europe, and Libya (see e.g. HA 8.28.606b17–19: “In general, wild animals are wildest in Asia, all are the bravest in Europe,
but also moist (\textit{GA} 5.3.782b33–783a1) and regions in Asia as not only hot but also as dry (\textit{PA} 2.9.655a9–10). In other words, both the author of \textit{Pr. 14} and Aristotle associate the same sets of character traits with either the hotness or coldness of regions and both suggest that there is an intermediate region with a climate that is beneficial for the character of those who live there.

In addition, both authors associate very similar sets of bodily features with the hotness or coldness of the regions. For instance, both authors attribute longevity to those living in hot regions and not to those living in cold regions (cf. \textit{Pr. 14.15} with Arist. \textit{Long} 1.465a7–10: “For some people are long-lived, while others are short-lived, differing from each other with regard to the regions [in which they live]: for those among the peoples who live in warm regions are longer lived, while those in cold regions are shorter lived”), explain curly hair in terms of the hotness and dryness of the region surrounding the Ethiopians (see \textit{Pr. 14.4} and Arist. \textit{GA} 5.3.782b29–783a1), and place Asia—and Asiatic features such as dark eyes—towards the south, while placing Europe—and European features—towards the north (\textit{Pr. 14.14.910a12–13} and 23–25: πρὸς μεσημβρίαν . . . πρὸς ἄρκτον). The author of \textit{Pr. 14} and Aristotle express different views about the tallness of people,\footnote{\textit{Pr. 14.8} places tall people in both hot and cold regions, while Aristotle only places them in hot regions: see \textit{Long} 5.466b16–22 and \textit{HA} 8.28.605b22–24; on this distinction between the two authors, see further in section 4.2 below.} but the former does single out a region “around us” where people are less extreme in size (\textit{Pr. 14.8.909b22–24}) and thus seems to agree with Aristotle that there is third, more moderate region, which is likely where the Greeks live.

Now, this kind of division of the world into three regions which are mainly north-south oriented fits with the Hecataean map of the world (see figure 1 below), and it is also the one used by Aristotle’s teacher Plato, albeit with a slightly different use of cultural stereotypes. For in his \textit{Republic} (435d3–436a3), Plato places the spirited Thracians and Scythians “in the region above us” (435d7: κατὰ τὸν ἄνω τόπον), associates “the love of learning” with “the region around us” (435d7: τὸν παρ’ ἡμῖν), and attributes the love of money to the Phoenicians and Egyptians, which presumably live in the southern regions below. On the other hand, this mapping of the world is distinct from the picture offered in the Hippocratic \textit{Airs Waters Places}, which divides the world into Europe (which includes the Scythians) and Asia (which includes the Libyans and Egyptians) and which places Europe to the west of Asia rather than to its north (Ionia is said to take up the middle and to have the best climate, but is and the most diverse in form in Libya’). or claims that Athens is part of Europe (\textit{Phys.} 5.1.224b21–22).
considered to be part of Asia).\textsuperscript{12} It is also distinct from a similarly east-west oriented depiction of the world that can be found in Herodotus. The latter criticizes the traditional Ionian tripartite division of the world into Europe, Asia, and Libya by claiming that there are no natural boundaries between Asia and Libya and argues that even if this way of counting continents were correct, the Ionians should at least have added the Delta of Egypt as a fourth part of the world (see figure 2 below). Ultimately, it seems, Herodotus rejects any kind of natural division of the world, but is willing to follow the conventions.\textsuperscript{13}

Thus, to the extent that any specific worldview can be extracted from the \textit{Problems}—and I acknowledge that the evidence is not very explicit—that worldview is most similar to Aristotle’s tripartite, north-south oriented map of

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\textsuperscript{13} See Hdt. 2.15–17 and 4.36 & 41–45; Thomas (2000, 75–86).
the world, slightly different from Plato’s, and distinct from the maps developed in the Ionian medical and historical traditions of the time.

3 Two Types of Mixtures and their Causal Interaction

While the reference to the mixture that is of a good or ideal quality in Aristotle’s Politics quoted above is to the mixture of the blood of the people who live in the intermediate region rather than to the quality of the environment itself, as is the case in Pr. 14.1, it is not difficult to show that both Aristotle and the author of Pr. 14 use the term “mixture” for the elemental mix of the environment as well as for the material nature of the people that live in that environment. In addition, both believe that these two mixtures interact causally in relevantly similar ways.
Pr. 14.1 is especially informative, because here the author makes explicit that there is a causal relation between the quality of the mixture of the environment and the quality of the mixture—possibly of body (cf. Pr. 3.4.871a24: ἡ κράσις τοῦ σώματος), but certainly—of thought (Pr. 14.1.909a15–17) of the people living in that environment: “For the best mixture is beneficial (συμφέρει) also for thought, while the excessive conditions cause degenerations (αἱ δὲ ὑπερβολαὶ ἐξιστᾶσι), and just as they distort the body, so too [do they distort] the mixture of thought (τὴν τῆς διανοίας κρᾶσιν).” In addition, he suggests that the “best mixture” of the environment is “best” because it is not excessive, and so perhaps holds some kind of mean between two extremes. Presumably, it contributes to thought by improving the material mixture that underlies the natural capacity for thinking. Extreme environmental conditions, on the other hand, corrupt the quality of the material mixture of the people that live there, and thereby distort their bodies and their capacity for thinking and render them “beastlike in characters and appearances” (Pr. 14.1.909a13: θηριώδεις τὰ ἔθη καὶ τὰς ὄψεις; cf. Pr. 14.4, where environmental dryness is described as having a warping effect on bodies of animals, and especially on bones and hair, and Pr. 1.3 for similar explanations in terms of the interaction between the mixture of the environment with the material mixture that constitute health in humans).

Similarly, even though the term “mixture” is not mentioned again in the chapters that deal with ethnic traits, the author does mention “natures” that respond to extreme environmental conditions by growing hotter or cooler themselves and thereby take up a counterbalancing temperature relative to that environment (see Pr. 14.8.909b10–11 = Pr. 14.16.910a39–b1: “is it because [one’s] nature—ἡ φύσις—is in an opposite condition to the regions and seasons…” and Pr. 14.15.910a28–29: “for some are much hotter, on account of their nature rising up—ἐπανιούσης τῆς φύσεως αὐτῶν—due to the coldness of the region”) as well as an “internal heat” that interacts with an “external cold” and a “surrounding heat” (Pr. 14.14. 910a14: τοῦ ἐντὸς θερμοῦ and 910a16–19: τὸ ἐκτὸς ψυχρὸν … τὸ περιέχον θερμόν). These references, I take it, are to Aristotelian-type individual, material natures that consist of a person’s blood and level of internal heat,14 which are acted upon by the material properties of the environment (on this, see further in section 4.1 below), and which can therefore be characterized as mixtures themselves. When balanced or proportionate, this kind of mixture of the body is elsewhere said to produce the health of the body.

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14 Pace Mayhew (2011, 443 and 449) who takes nature in Pr. 14.8 and 14.16 (but not in Pr. 14.15) to refer to the nature of places and seasons.
and the best kind of natural character traits: see especially Pr. 30.1 on how diseases result from having too much black bile in one’s mixture of the body and on how drinking wine changes that mixture and thereby produces different kinds of character traits.

Concerning character traits, we saw in the passage quoted above from Politics 7.7 that Aristotle also characterizes the—what I believe to be\(^{15}\)—material natures of people living in different parts of the world as being either “onesided” or “well-mixed,” and from the biological works we know that Aristotle uses the term “well-mixture” to characterize blood that is optimally balanced and that, in humans, this means that it is hot, pure (i.e., not earthy), and moist (see especially GA 2.6.744a30–31; PA 3.7.670b23–26; and Sens. 5.444a28–b7). Creatures with this kind of mixture Aristotle deems best (PA 2.2.648a9–11): “But those with hot, thin, and pure blood are best; for the ones that are such are at once in a good condition with regard to both courage and intelligence.”\(^{16}\)

Roughly speaking, Aristotle believes that natural courage requires an appropriate level of heat in the blood (too much heat produces spiritedness, whereas a lack of heat produces timidity and cowardice, and both excesses and deficiencies in spirit cripple one’s deliberative capacity and the ability to form friendships)\(^ {17}\), whereas natural intelligence requires an appropriate level of moisture and purity of the blood (this type of blood makes the sense-organs soft and calm and therefore more receptive to sense-impressions, whereas too much “earth” in one’s blood makes the sense organs hard and causes natural stupidity)\(^ {18}\). Hence only men with blood that is hot, moist, and pure—which are apparently found predominantly in the intermediate regions of the world—possess the kind of well-mixedness of blood that makes them suitable for the life and training as future citizens of the ideal city.

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\(^{15}\) Aristotle does not say explicitly in Politics 7.7 that it is the material nature of future citizens he is interested in, but this interpretation is consistent with Aristotle’s earlier announcement that lawgivers should also take care of procuring the best material conditions for the future ideal city, which include its location and the quality of the men: see Pol. 7.4.1325b39–1326a5.

\(^{16}\) For the causal relation between the material properties of blood and the kind of natural character traits animals have, see PA 2.2–4, especially PA 2.4.651a12–17: “it is reasonable that of many features the cause is the nature of the blood, both with respect to character among animals and with respect to perception: for it is the matter of the entire body. For nourishment is matter, and blood is the last stage of nourishment. It therefore makes a great difference whether it is hot or cold, thin or thick, turbid or pure.”

\(^{17}\) Heath (2008, 257–58).

\(^{18}\) See e.g. DA 2.9.421a18–26; PA 2.16.660a11–13; and HA 1.15.494b6–17.
That these men are found mostly in certain types of climates is no accident: Aristotle is explicit about the fact that environment can cause differences of the more and the less within the species-specific character profile of living beings (*HA* 8.29.607a9: “for regions produce differences also with regard to character traits”) and, just as the author of *Pr*. 14, he believes that this is due to a causal interaction between the mixture of the environment (τὸ περιέχον) and the material nature—which includes the blood—of the living beings that live in that environment (*Long*. 3.465b25–29): “The environment acts with or against [living beings]: and because of this, things that change become more or less enduring than their nature [warrants].”¹⁹ According to Aristotle, living beings are in the best material condition when the result of this interaction between the environment and the material nature constitutes a proportionate blend, that is, when it constitutes a stable balance between the contrary material potentials of the two mixtures involved. When this is the case, the living beings will be, among other things, healthy (*Phys*. 7.3.246b5–6), long-lived (*GA* 4.10.777b6–8: “the cause of whichever animal being long-lived is the being mixed—κεκρᾶσθαι—in a manner resembling the surrounding air”), and fertile (*GA* 4.2.767a28–35):

And one region differs from another in these respects and one water from another water for the same reasons: for the food and the condition of the body become of a certain quality because of the mixture of the surrounding air (διὰ τε τὴν κρᾶσιν τοῦ περιεστῶτος ἀέρος) and of the [food] entering [the body], and most of all because of the nourishment provided by water: for this is consumed most of all, and this [i.e. water] is present in everything as food, even in the solids. Because of this hard and cold waters produce sometimes infertility, sometimes the birth of females.²⁰

Aristotle believes that this kind of proportionate blend is achieved most easily when the environment is qualitatively most similar to the living being’s own material nature (*Resp*. 14.477b14–17): “For contrary places and seasons preserve the [bodily] dispositions that have excesses, but the [material] nature is preserved mostly in their proper locations.” Thus, plants, which are constituted mostly from earth, thrive in the dry environment of the land; water animals, which are constituted mostly from water, thrive in the moist environment of the water; and winged animals and land animals, which are

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¹⁹ Cf. *Phys*. 8.2.253a7–21 on how the environment constantly imparts motions on living beings.

²⁰ See also *GA* 3.2.752b28–35.
constituted mostly from air and fire respectively, thrive in the warm environment of the air (Resp. 13.477a27–31 and 14.477b30–478a1). And, just as the author of Pr. 14.1, Aristotle believes that excessive conditions in the environmental mixture cause degenerations and distortions in the material natures of living beings, which can result, for instance, in their destruction, putrefaction, or in their becoming diseased (cf. Pr. 1.909a15–16: αἱ δὲ υπερβολαὶ with GA 4.10.777b28–30; see also Mete. 4.1.378b27–379a14 and HA 8.12–17 where Aristotle mentions the extreme conditions of climate as causes for animal migration in order to avoid death).

In sum, both Pr. 14 and Aristotle share very similar assumptions about mixtures and their interaction: it characterizes both the material properties of the environment and of the material natures of living beings; the “best” mixture of the environment is somewhere intermediate between the excesses of heat and cold (and possibly, moistness and heat); and this environmental mixture is best because it promotes the balance of the material nature of the living beings who are surrounded by that environment; and, finally, this kind of well-mixedness of the blood is thought to produce positive natural attributes, such as health and strength, natural courage, or intelligence. Now, of course, some of these ideas are not unique to the Peripatetic tradition. For instance, in the Timaeus (24c5–d3), Plato suggests that Athena chose the specific location for her city on the grounds that it had a “well-mixedness of seasons” (c6: τὴν εὐκρασίαν τῶν ὡρών), such that it would produce “the most intelligent men” (c7: φρονιμωτάτους ἄνδρας) and men that are lovers of war and wisdom just like her. Furthermore, in chapter 12 of Airs Water Places, the Hippocratic author identifies “the mixture of the seasons” (12.10: ἡ κρῆσις τῶν ὡρέων) as the cause for the differences in beauty, size, and character traits of the people and other living beings located in Europe and Asia. In addition, he singles out the mixture of the seasons belonging to the region that lies in between the heat of the east and the cold of the west as being responsible for the favorable conditions in the part of Asia that is presumably to be identified as Ionia (12.10–11 and 12.14: ἐν μέσῳ), while blaming seasons that are not well-mixed as the causes of bodily distortions and negative character traits (24.24–27; 24.25: οὐκ εὐκρητα). And finally, Herodotus claims that while the most remote regions have drawn the most beautiful things as their lot, Greece—as perhaps lying in between these remote regions—acquired “by far the most beautiful seasons” (3.106.2–3; 3: τὰς ὥρας πολλὸν τι κάλλιστα). However, I believe that the nature of the causal

21 Cf. Eur. Med. 827–41, where the chorus describes the Athenians as feeding upon “the most glorious wisdom” and as “always gracefully stepping through the brightest air,” and Athena as having blown “temperate (μετρίας) and sweetly blowing winds” on the land.
explanations that are offered in Pr. 14 is closer to the patterns of explanation that can be found elsewhere in Aristotle than to the patterns of explanations represented in the (roughly) contemporary medical and historical traditions, so let me turn to those causal explanations next.

4 Explaining Ethnic Properties

The types of causal explanation that are offered in Pr. 14 as possible answers to the puzzles about how environment influences the character traits and bodily features of people living in that environment are, as I will show below, very similar to the type of material-efficient explanation Aristotle offers for the physical differences of the more and the less in the attributes of living beings as produced by environment in GA 5. I will first discuss the explanations offered regarding differences in ethnic character traits and then turn to those concerning bodily features.

4.1 Material-Efficient Explanations of Differences of the More and the Less in Ethnic Character Profiles

Among the chapters in Pr. 14 dealing with ethnic character profiles, 8, 15, and 16 offer the most explicit causal explanations for why extreme environmental heat or cold correlate with specific character traits, so I will focus mainly on these chapters (Pr. 14.122 mentions, but does not explain, the effects of

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22 Even though Pr. 14.1 does not make use of Aristotelian explanations, the language used to describe the influence of environment on intelligence seems distinctly Aristotelian to me:

First, “beastlike” as a characterization of someone’s intellectual capacities (909a13: ἡριώδεις τὰ ἐθη) recalls Aristotle’s remark in EN 7 that “beastliness” (which is one of the three moral dispositions one ought to avoid) is a rare condition that is mostly found “among foreigners” (although it can also be produced “by disease or maimings”; see EN 7.1.1145a15–32). Later, Aristotle also uses the term to describe cannibals who live near the Black Sea, mentions that it is an excessive disposition, and associates it with a kind of natural stupidity found among foreigners (EN 7.5.1148b15–24).

Second, the “degenerations” of body and thought that result from extreme conditions of the environment (909a16: ἐξίστασι) are perhaps similar to the degeneration of characters as expressed in Aristotle’s Rhetoric (2.15.1390b21–31): “Good birth” is in accordance with the excellence of the stock, but “being true to one’s descent” (γενναῖον) is in accordance with not degenerating from [one’s] nature (κατὰ τὰ μὴ ἐξίστασαι τῆς φύσεως). . . . Naturally talented stock degenerates into more manic characters (ἐξίσταται δὲ τὰ μὲν εὐφυὰ γένη εἰς μανικώτερα ἡθη), such as for instance the offspring of Alcibiades and of Dionysus, and steady [stock degenerates into] stupidity and dullness, such as for instance the offspring
environmental mixture on intelligence). Two types of causal explanations are offered: I will first discuss the physiological explanation and next turn to the psychological-historical one.

Generally speaking, the physiological explanations posit a compensatory\textsuperscript{23} relation between the material properties of the environment and the internal material nature of people, according to which cool environments produce extra heatings of the material nature of the people living in those environments, while hot temperatures produce a cooling, and postulate that extra hotness of body or nature produces courage, while coolness produces cowardice. As for how exactly this heating or cooling of the material nature of people is caused, two interpretations are available.

First, the changes in the bodily “temperature” of people could be caused by a kind of activity of the material nature itself, which counterbalances or compensates for the extremities in the surrounding environment, as is suggested in the explanation in \textit{Pr}. 14.15 of why people in hot regions are wiser than those in cold regions (910a27–32):

> Is it because of the same factor because of which also the old [are wiser] than the young? For some, since because of the coldness of the region \textit{their nature rises up}\textsuperscript{24} (ἐπανιούσης τῆς φύσεως), are much hotter, such that they resemble those who have drunk too much, and they are not investigative but courageous and optimistic (οὐκ εἰσὶ ζητητικοὶ, ἀλλὰ ἀνδρεῖοι καὶ εὐέλπιδες). Others in hot regions are sober because of having been cooled (διὰ τὸ κατεψυχθαί).

Material natures, on this reading, actively preserve the living beings of which they are part by producing a kind of proportionate mean between the environment and themselves: if the temperature of the environment goes down, the material nature pushes its own temperature up, and vice versa, and this in turn leads to differences in the level of courage or cowardice of people.\textsuperscript{25} This

\textsuperscript{23} Heath (2008, 254 n. 24).

\textsuperscript{24} Mayhew (2011, 447) translates “because their nature resists owing to the coldness of the place,” but I believe that “rising up” is a better translation of ἐπάνειμι in this context; cf. Pl. \textit{Tim}. 22e2–4, who uses the verb to describe how in Greece, water, instead of raining down from above, tends to “naturally well up from below” (κάτωθεν... ἐπανιέναι πέφυκεν).

\textsuperscript{25} See Mayhew (2011, 449 n. 27) who makes a similar suggestion for the interpretation of \textit{Pr}. 14.15.
interpretation also fits—at least at first sight—with the first part of Pr. 14.8 (909b10–13):

Is it because [one’s] nature is opposite to regions and seasons, because if [one’s nature] were in the same condition it would necessarily quickly be consumed (διὰ τὸ ὁμοίως ἐχόντων ἀνάγκῃ διακαλίσθαι ταχέως)? And the ones who are hot with regard to their nature are courageous, while the ones who have been chilled are cowardly.

What appears to be responsible for the preservation of people according to this account is again the fact that material natures are somehow able to take on the contrary material quality from the one that dominates the environment. This type of explanation, however, is rather un-Aristotelian, as Aristotle never describes material natures as being active in that way (if anything, this would be the goal-directed work of a formal nature: cf. Cael. 2.12.293a2 on nature as a kind of equalizer—ἀνισάζει ἡ φύσις—and producer of order). The only passage in Aristotle that—as far as I can tell—would support such an active, compensatory role of material natures, quotes a view from someone else26 (PA 2.2.648a25–26): “For some say that the water animals are hotter than the land animals, saying that the heat of their nature equalizes the cold of their location (λέγοντες ὡς ἐπανισοῖ τὴν ψυχρότητα τοῦ τόπου ἡ τῆς φύσεως αὐτῶν θερμότης).” In passages that represent Aristotle’s own views, it is in fact the environment that acts as a kind of—accidental—equalizer (Resp. 14.478a1–4):

However, concerning the dispositions [of the body], the ones that are extremely hot are saved (σῴζονται) more in a cold environment, whereas the ones that are in a cold condition are [saved more] in a hot environment, for the region equalizes the excess of the disposition to an appropriate degree (ἐπανισοῖ γὰρ εἰς τὸ μέτριον ὁ τόπος τὴν τῆς ἑξεως ὑπερβολήν).27

26 Presumably Empedocles: cf. Theophrastus, CP 1.21.5.8–6.1: “A second cause is [the quality] of the region (for example its being cold), for opposites are capable of persisting in opposite [regions], some persisting in hot [regions], others in cold [regions]. For this way is also how nature generated them from the outset, since they are killed by a similar [condition] due to the excess, while being preserved by an opposite [condition], as there comes to be a kind of well-mixedness, as also Empedocles says about animals: for nature brings to water the ones that are excessively fiery.”

27 Cf. Resp. 14.477b14–17 quoted above and Pr. 1.11.860b8–14, where the fact that the dryness of the summer and fall can bring about a well-mixedness of the material natures of phlegmatics and women (who normally suffer from permanent wetness) is explained by
However, the remainder of ch. 8 suggests that perhaps the author of *Pr.* 14 does not actually believe that material natures are such active, compensatory principles either (909b13–15): “And it happens that those living in hot regions are chilled, while those in cold regions are heated up with regard to their nature (συμβαίνει δὲ τοὺς μὲν ἐν τοῖς θερμοῖς ὄντας καταψυχθαί, τοὺς δὲ ἐν τοῖς ψυχροῖς ἐκτεθερμάνθαί τὴν φύσιν).” In this section, the material natures are conceptualized as the patients in this process of change, while the heat and the cold of the environment act as the efficient causes activating this change: the heating and cooling of natures is something that happens to those natures.

This second, alternative causal explanation is more explicit in ch. 16 (910a38–910b9), which is otherwise largely identical to ch. 8:28

Why are those in hot regions cowardly, while those in cold ones are courageous? Is it because [one’s] nature is in an opposite condition to regions and seasons, because if [one’s nature] were in the same condition it would quickly be consumed (διὰ τὸ ὁμοίως ἔχοντων διακάεσθαι ἂν ταχέως)? And the ones who are hot with regard to their nature are courageous, while the ones who have been chilled are cowardly. And it happens therefore (δὴ) that those living in hot regions become chilled (καταψυχθαί)—for because their body is porous, their heat escapes to the outside (ἀραιοῦ γὰρ ὄντος αὐτῶν τοῦ σώματος τὸ θερμὸν αὐτῶν ἐξω διεκπίπτει), while those in cold regions are heated up with regard to their nature on account of their flesh being thickened due to the external cold, and being thickened it wraps up the heat inside (διὰ τὸ ἐκ τοῦ ἐκτὸς ψύχους πυκνοῦσθαι τὴν σάρκα, πυκνουμένης δὲ ἐντὸς συστέλλεσθαι τὸ θερμόν).

In this chapter, the addition of the particle δὴ suggests that the account following “and it happens” is supposed to explain how one’s nature ends up in the opposite condition to the seasons. The reason why natures become heated or chilled is that the external temperatures produce material-efficient changes in the skin of those who live in those conditions: environmental heat makes the skin porous, causing internal heat to escape, and thereby the heat of the internal material nature to go down, while environmental cold thickens the skin, trapping the internal heat inside and making the heat of the internal, material nature go up. People’s material natures, then, compensate for extremities in reference to seasons “pulling” their natures—which are both excessive in one direction—“into the opposite direction.”

28 The passages in SMALL CAPITALS are the ones that are different from the text in ch. 8.
their environment by a form of material necessity that is initiated by the environment itself and not by their material natures.

This latter type of explanation is very much like the explanations Aristotle offers in \textit{GA} 5, where he deals with the differences of the more and the less in the attributes of animals that mostly come to be during the later development of (human) animals after birth and that are often \textit{not realized uniformly} in all living beings that possess them and sometimes not even within one and the same species. These include differences of the more and the less produced by environment, such as, for instance, differences in the structure of the hair between Scythians and Thracians who live in moist environments on the one hand and the hair of Ethiopians who live in dry environments on the other hand (3.782b32–783a1; see my discussion below), differences in the pitch of voice of animals living in cold versus hot environments (7.788a16–20), a change in color in the feathers of birds and hairs of wild quadruped due to changes in the season (6.786a30–34), as well as differences in the quality of hearing produced by moist climates and mixtures (2.781a30–34). Aristotle's explanation for why human hair is affected differently by climate from that of sheep is especially relevant (3.783a12–32):

Sheep living in cold climates (ἐν τοῖς ψυχροῖς) suffer the opposite from humans: for the hair of Scythians is soft, but the hair of Sarmatian sheep is hard. And the cause (αἴτιον) of this is the same as with regard to all wild animals. For the cold hardens them through thickening (πηγνύουσα), on account of the drying: for as the heat is pressed out the moisture evaporates and the hair and skin become earthy and hard. The cause of this is in wild animals their open air life, but in others the quality of the location (ὁ τόπος τοιοῦτος) they are in. A sign of this is also what happens to sea-urchins. . . . [Their spines] are hard and have turned into stone because of the cold and the coagulation. In the same way, also other plants turn out harder and earthier and stonier when they come to be in areas exposed to northern winds than when facing southern winds. . . . For they are all more chilled and their moisture evaporates.

As in the example from the \textit{Problems}, Aristotle describes the cold of the environment as having a hardening and thickening effect on the parts of the body exposed to that environment. And, just as in the \textit{Problems}, the phenomenon to be explained—a difference of the more and the less in an affection of a feature that belongs to all members of the same species—does not require any teleological explanation but can be accounted for solely in terms of material-efficient causes.
Now contrast these explanations with the ones offered in the Hippocratic *Airs Water Places*. One the one hand, the author of this treatise agrees with Aristotle and the author of *Pr*. 14 that moderate material properties of the environment are most conducive to certain favorable properties of the living beings that live in that environment. For instance, about Asia, the author states (*Aërs* 12.7–13; 27–29):

For everything in Asia comes to be much more beautiful and larger: for the one region is milder than the other, and the characters of the people are milder and gentler. And the cause of this is the mixture of the seasons, because it lies in between rising of the sun towards the east and further away from the cold. It provides growth and mildness most of all where there is nothing that dominates by force, but where equability prevails over everything (ὁκόταν μηδὲν ἡ ἐπικρατέον βιαίως, ἀλλὰ παντὸς ἰσομοιρίη δυναστεύῃ). . . . It is plausible that this region is very close to the spring with regard to the nature and moderateness of its seasons (τὴν μετριότητα τῶν ὑμέαν).

On the other hand, as is also clear from this passage, what the Hippocratic author believes is truly the cause of those favorable properties of the people and plants that live in between the hot and cold regions is the fact that that region is characterized by a serene and homogeneous climate (see *Aërs* 12.14: ὡμοίως), that is, by a climate that does not possess many violent changes. The causal relation between the climate and the properties of the bodies and characters of the people that live in that climate can be characterized as one of sympathy rather than one of compensation:29 the gentler and more even the climate is, the gentler and more uniform the inhabitants are in both character and physical appearance, whereas the greater and the more violent and the more frequent the changes of the seasons are, the more courageous or war-like and physically diverse the inhabitants are (see *Aërs* 13.3–17 [4–5: διὰ τὰς μεταβολὰς τῶν ὑμέαν]; 16.3–4; 23.2–5; and 24, *passim*). Because of this, intermediate and serene climates are incapable of producing courage (*Aërs* 12.29–31 and 16.1–9), which is instead instilled through “shocks to the mind” (16.5 and 23.15–16) produced by frequent and violent changes of the seasons, which act as a kind of “training program” of both body and mind. This difference in “training,” then (and not the effects of material-efficient causation on the body as in

Pr. 14 and Aristotle), is the reason why the Europeans are stronger and more courageous than the Asians: the bodies and minds of the Europeans are constantly changed and hardened through the seasons, whereas the Asians are left at peace (16.1–11; 23.1–23; and 24, passim). In addition, unlike the author of the Problems, the Hippocratic author likes to juxtapose the influence of climate with that of laws and constitutions, which can produce the same effects (16.11–27 [11: καὶ προσέτι διὰ τοὺς νόμους]; and 23.23–31). And finally, the Hippocratic author does not mention how environment might affect the intellectual capacities of the people living in those environments; Airs Water Places only deals with what we would call “personality” traits, while the author of the Problems (as well as Aristotle) includes intellectual traits in the character profiles that are affected by the environment.

Herodotus appears to accept a very similar account of how climate influences character as is presented in Airs Waters Places. Although for the most part Herodotus emphasizes the role of law or custom over nature, the last chapter of his Histories includes an anecdote about Artembares and Cyrus, king of the Persians. Artembares suggests to Cyrus that the Persian people leave the rugged land on which they live now and find a region that is better. Cyrus does not like the plan, and replies (9.122.12–17):

Do this, but by ordering this advise them to be prepared to no longer be rulers but instead be ruled. For from soft lands soft men tend to come to be (φιλέειν γὰρ ἐκ τῶν μαλακῶν χώρων μαλακοὺς ἄνδρας γίνεσθαι): for it is not possible that from the same soil both amazing fruits come to be and men who are good at war.

30 See, however, HA 8.29.607a9–13, where Aristotle discusses how differences in regions produce differences in the character traits of animals and states that animals living “in rugged highlands will be different from those living in the soft lowlands,” as the former will be “fiercer and bolder in their appearance.” Although Aristotle does not provide any causal explanation for this, the suggested correlation between the ruggedness of the environment and the toughness in character is very similar to the explanations that dominate the Hippocratic Airs Waters Places.

31 This type of explanation is also different from Aristotle’s, who (as we saw in Pol. 7.7. 1327b18–38 quoted above) suggests a different causal relation between constitutions and natural character traits: for Aristotle, climate produces changes in natural character traits and these different character profiles produce differences in the natural ways in which people organize themselves and their cities. (Of course, Aristotle also believes that laws and constitutions can change people’s character traits, but this is part of his program of moral development and not of ethnography.)

After hearing this, the Persians walk away, agreeing with Cyrus, and choose “to rule while living in a poor region over sowing the plains while being slaves to others.” The causal relation between climate and character in this anecdote is left implicit, but the idea that soft lands produce soft people and the implication that it is because of the harsh living conditions of the Persian people that they are so successful at warfare is very similar to the theory of environmental sympathy presented in the Hippocratic treatise.

In addition to these physiological explanations, the author of *Pr. 14* also offers a closely related psychological-historical explanation for the “fact” that people living in hot regions are wiser than those living in cold ones (*Pr. 14.15.910a29–37*). On this account, people in cold regions have higher levels of internal heat, which makes them “resemble those who have drunk too much,” making them “not investigative but courageous and optimistic,” and so they inquire less, while people living in hot regions are like those who are sober and who are therefore scared rather than courageous, making them inquire more. The difference in wisdom thus does not reflect a difference in natural capacities but rather reflects how differences in personality traits (such as courage and cowardice) affect the investigative nature of people: those who inquire more are wiser because they discover more, and vice versa. As a second explanation, the author also suggests that this differentiation could be due to the longevity of those living in hot regions, while those living in cold regions have perished due to floods: those living in hot regions are like old people who have had more time to acquire wisdom, whereas people in cold regions are like young people who die before having been able to acquire much wisdom.

The analogy used in this explanation between the wise people who live in hot regions and those who are sober or old on the one hand and between the less wise people living in cold regions and those who are drunk or young on the other hand, as well as the personality traits associated with them, is again one that could well be Aristotelian in origin. For in his *Rhetoric*, while provid-_References to historical floods destroying humans are also present in Plato (see, e.g., *Leges* 677a4–6: “...that there have been many destructions of humans through floods and diseases and many other things, in such a way that only a small portion of the human race has survived”; *Leges* 679d2; and *Tim. 25c7*) and Aristotle (*Phys* 4.13.222a22–26).

Potential explanations for why people in hot regions live longer are provided in *Problems* 14.9–10: aging is either a form of putrefaction or of cooling of the internal heat or of drying, and people living in hot regions are either drier and therefore more difficult to putrefy, or are less quickly or less likely cooled, or are better at preserving their heat and moisture.
ing character profiles of the young, the old, and the men who are in the prime of their life (2.12–14), Aristotle, too, compares the young with those who have drunk too much (2.12.1389a18–19: “just as men overcome by wine, so too are young people thoroughly heated—διάθερμοι—by their nature”) in describing the hotness of their nature,35 which in its turn explains their courage and optimism (2.12.1389a25–26: ἀνδρειότεροι…εὐέλπιδες).36 And although Aristotle does not characterize the old as sober, he does explain their cowardly character traits in terms of the coldness of their nature (2.13.1389b29–32: “for they are cowardly and always anticipating danger. For their states are the opposite from that of the young: for they are cold, whereas [the young] are hot, such that old age has paved the way for cowardice—for fear is a kind of chilling”). There are no such analogies in either the Hippocratic *Airs Waters Places* or in Herodotus’ *Histories*.

4.2  **Material-Efficient Explanations of Differences of the More and the Less in Ethnic Bodily Features**

The explanations that are offered in *Pr*. 14.4, 8, and 14 for differences of the more and the less in the bodily features of certain ethnic groups—i.e. bowleggedness, curly hair, tallness, and dark eyes in the case of people living in hot regions and tallness and blue eyes in the case of people living in cold regions—are similarly couched in the Aristotelian language of material-efficient causation and are exactly the kinds of differences of the more and the less Aristotle sets out to explain in *GA* 5 (differences in eye-color especially are used as an example of something that needs to be explained in terms of “the matter and the source of motion as coming to be from necessity”: see *GA* 5.1.778a17–20 and 778a29–b1).

For instance, in explaining the bowleggedness of Ethiopians and Egyptians, the author of *Pr*. 14.4 draws an analogy between what happens to wooden beams when they are being dried out under the influence of heat and what happens to the bodies of animals under similar conditions: they both get warped (909a28: διαστρέφεται).37 As evidence for this explanation the author points to the fact that their hair is curlier as well, and curliness is “like the

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35  Cf. *EN* 7.14.1154b9–10: “Similarly, in youth, people are—because of the growth that is going on—in a bodily condition similar to those who are drunk…”

36  On the effects of drinking wine on character in Aristotle, see also *HA* 7.5.585a32–33, 8.12.597b27–29; and *EE* 3.1.1229a18–20.

37  See also *EN* 2.9.1109b1–12, where Aristotle compares the habituation of men with the straightening of bent sticks.
crookedness of hair” (909a30–31: ὥσπερ βλαισότης τῶν τριχῶν). In both cases, the drying heat causes the bodily parts to twist immediately, without first changing the internal heat or the material nature of the people in question. This is also very similar to how Aristotle explains differences in the straightness and curliness of the hair of different ethnic groups (GA 5.3.782b32–783a1): according to Aristotle curly hair is harder than straight, because dry things are harder than moist things, and Ethiopians and people in hot countries have curly hair because “their brains and the surrounding air are dry.” Environmental heat thus causes hair to dry out from the outside, such that it becomes curly of material necessity, without necessarily also changing the mixture of the material nature of people, even if the dryness of the latter is also due to the heat of the environment.

Similarly, in explaining the tallness of people living in both cold and hot regions in Pr. 14.8.909b15–24, the author states that in both cases this is due to heat. For cold regions produce hotter internal natures, such that these people possess “an extreme source of growth,” while hot regions do not from the outside impede the growth of the people living there, even if their source of growth must itself be smaller. Only “in the region around us” is the source of growth smaller and is the growth tempered by the external cold, thereby causing the people living there to be less tall. Although structurally this explanation is thus very similar to material-efficient type explanations that are especially common in GA 5, it actually conflicts with the explanation Aristotle himself provides for the tallness of people. For according to Aristotle, only people (and animals) living in hot regions are tall, and this is caused by the hot humidity of the environment, which feeds the life-giving internal heat and moisture of living beings and thereby enhances their size (and longevity), whereas cold environments easily congeal moisture and thereby inhibit the growth (and longevity) of the people living there, especially since their moisture is already more watery due to the coldness of the environment (Long. 5.466b16–22). In other words, both authors agree that heat produces growth while cold inhibits it, but Aristotle adds moisture as a second causal factor to his explanation (for moisture is according to him “life-giving”: GA 2.1.733a11) and holds that the two factors combined explain the tallness and longevity of people living in

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38 Cf. IA 16.713b9–10 on the crookedness of the legs of non-blooded polypods.
39 Contrast, however, Pr. 38.2: there dryness of the environment is taken to be the cause of the reddishness and thinness of the hair of people living in the north.
40 Aristotle also believes that environmental coldness can make it entirely impossible for certain kinds of animal to come to be: see Long. 5.466b22–28; HA 8.28.605b22–24 and 606b2–3; and GA 2.8.748a22–26.
hot regions. Interestingly, the Hippocratic author of *Airs Waters Places* also appears to explain tallness more in terms of the moisture of the environment rather than in terms of its heat (e.g., the Phasians who live in foggy marshes are “tall in stature”: *Aërs* 15.14; cf. 24.9–12), and sides with Aristotle in characterizing the Scythians (and animals living in Scythia) as short due to the coldness of their environment (*Aërs* 19.3–18). The explanation offered in *Pr.* 14.8 thus appears to be rather unique both in its attribution of tallness to people living in cold regions and in its explanation.

And finally, in *Pr.* 14.14, differences in the darkness and lightness of eyes are explained *first* in terms of the presence or lack of internal heat and the level of moisture that is present in the eyes as a result of internal heat being present or lacking, with the internal heat itself either being locked in or pressed out of the eyes due to the surrounding heat or cold. Because of this, people in the north are blue-eyed due to an excess of internal heat present in the eyes that is locked in there by the environmental cold, while people in the south are dark-eyed due to the lack of internal heat in the eye (the environmental heat causes their internal heat to escape) *as well as* to the leftover moisture in the eye (which is locked in there because of the external heat). Ultimately, it is the leftover moisture taking over the space where otherwise there would be fire or light that causes darkness of the eye. The author attributes this view to Empedocles, and the explanation indeed fits broadly with Aristotle’s version of Empedocles’ explanation of the differences of the more and the less in eye-color in *GA* 5.1.779b15–20, which postulates that blue eyes have more fire than water (and therefore see better at night) while dark eyes have more moisture than fire (and therefore see better during the day). Aristotle himself, of course, criticizes this view and claims that these differences are *solely* due to differences in the level of moisture in the eye (much liquid causes darkness and makes the eye move less easily under the influence of sense impressions, while little liquid produces blueness and makes the eye move more easily: see *GA* 5.1.779b14–780a13). Thus, while in this case Aristotle might have formed the *source* for explanation presented in *Pr.* 14.14 (cf. *Sens.* 2.437b9–438a4), it is not his own view that is preserved.

The same is true for the second, alternative explanation that is presented in *Problems* 14.14, which simply posits that there is a correspondence (910a22: ὅμοιοῦται) between the color of the eyes and the color of the rest of body, but without offering a further explanation for why this correspondence should hold. The assumption that because their skin is black, other bodily parts of the Ethiopians will be black as well, appears to be a more common one: for instance, in a different problem, the author is puzzled about the fact that Ethiopians have very white teeth, but black nails, and postulates that while
nails grow from the skin and therefore have the same color, teeth are dried and thereby turned white by the sun (Pr. 10.66); and Herodotus makes the surprising claim that the Ethiopians have black semen (3.101.4–7). Again, this is not a view endorsed by Aristotle,41 as we already saw above; and although he does believe that the color of hair and feathers in non-human animals is caused by the material nature of the skin, such that white skin produces white hair etc., he does not think that this causal relation applies to humans (GA 5.4.784a23–26 and 5.5.785b2–15).

In sum, then, the problems collected in Pr. 14 offer a wealth of ethnographical material that is clearly much indebted to the debates about the relation between environment and ethnic traits in the philosophical, medical, and historical treatises of the time, and, as I have argued, especially—but not uniquely—to Aristotle's views.

**Bibliography**


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41 Aristotle criticizes Herodotus's claim in *HA* 3.22.523a17–18 and *GA* 2.2.736a10–13: “Herodotus did not speak the truth when he claimed that the semen of the Ethiopians is black, as if it were necessary that because the color of their skin is black everything should be black…”

