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First Assignments

Assignments for First Class Meetings

We hope you are doing plenty of resting and relaxing. Here are a few tasks to accomplish to get geared up and ready.

Seminar
Your first seminar reading will be Homer's *The Iliad* (Books I–VI).

Language
We recommend that before the first class you memorize the Greek alphabet. If you feel that your mastery of English grammar is lacking, we suggest you review its important rules.

Mathematics
Freshman math begins with Euclid's *The Elements.* For the first class, please read the "Definitions, Postulates, and Common Notions" at the beginning of Book I.

Laboratory
The lab reading for the first class is enclosed.

St. John's College is committed to the careful study of great books, and we believe that students benefit by maintaining their own collection of the most central of these books. Many of these books are especially helpful if they are kept within reach of the student's desk. Even if students do not intend to keep all of their books until or beyond graduation, the choice of editions can sometimes be important. We believe that students benefit from being able to compare editions and translations, especially of their seminar readings, and such careful comparison is not possible when buying books on-line. Therefore, as an affirmation of the College's commitment to careful and reflective study, and to encourage students to maintain their own collection of the most central of these books. Each semester we will use $200 of your student fees to establish a credit of that amount at the College Bookstore. A committee of tutors has assembled a freshman "Essentials" bundle. Freshmen will receive, upon completion of registration and the receipt of all deposits, a copy of each of the following tutorial books: Luschnig–An Introduction to Ancient Greek for language and Euclid's Elements for math. The remaining credit will be used to purchase the two Freshman Lab Manuals required for spring semester and the Freshman Music Manual. Any leftover credit may be used to purchase class materials.

C.A.E. Luschnig

An Introduction to Ancient Greek

A Literary Approach

Second Edition

Revised by

C.A.E. Luschnig

Deborah Mitchell

The Greek Alphabet
and the Structure of Greek

In this lesson you will learn the letters and sounds of Greek, the diacritical marks, the classification of letters, the parts of speech, and useful definitions. You will be able to read words, recite the alphabet song, translate selected sentences, and read signs.

ALPHABET AND SOUNDS OF GREEK

The Greek alphabet has twenty-four letters (γράμματα: *grammata*), given below with their names, usual transliterations into the Roman alphabet, and a recommended pronunciation.

The Alphabet

Character		Name	Transliteration		Pronunciation
Α	α	ἄλφα	alpha	a	short: c*u*p; long: f*a*ther
Β	β	βῆτα	beta	b	b
Γ	γ	γάμμα	gamma	g (ng)	hard g, ng, go*ing*
Δ	δ	δέλτα	delta	d	d
Ε	ε	ἒ ψιλόν	epsilon	e	short e, b*e*t
Ζ	ζ	ζῆτα	zeta	z	sd, wis*d*om; dz, a*dz*e
Η	η	ἦτα	eta	e	long ε (*cf.* French *fête*)
Θ	θ	θῆτα	theta	th	t-h
Ι	ι	ἰῶτα	iota	i	short: b*i*n; long: b*ea*n
Κ	κ	κάππα	kappa	k, c	k
Λ	λ	λάμβδα	lambda	l	l
Μ	μ	μῦ	mu	m	m
Ν	ν	νῦ	nu	n	n
Ξ	ξ	ξῖ	xi	x	ks/x: ta*cks*, ta*x*
Ο	ο	ὂ μικρόν	omicron	o	short o: p*o*t (German *Gott*)
Π	π	πῖ	pi	p	p
Ρ	ρ	ῥῶ	rho	r, rh	trilled r (as in Italian)
Σ	σ, ς	σίγμα	sigma	s	as in *s*ay
Τ	τ	ταῦ	tau	t	t
Υ	υ	ὗ ψιλόν	upsilon	y	French u; German ü
Φ	φ	φῖ	phi	ph	p-h
Χ	χ	χῖ	chi	ch	k-h
Ψ	ψ	ψῖ	psi	ps	hi*ps*
Ω	ω	ὦ μέγα	omega	o	g*o*

Vowels, Diphthongs, and Iota-subscript

1. Vowels

The vowels (φωνήεντα) are α, ε, η, ι, ο, υ, ω. Of these, α, ι, and υ are of variable quantity, that is, they can be either long or short. Of the others, ε (ἒ ψιλόν *plain e*), and ο (ὂ μικρόν *little o*) are always short; and η and ω (ὦ μέγα *big o*) are always long. Long vowels were originally pronounced for about twice as long as short ones. Vowel length affects pronunciation, accent, and the meters of poetry.

2. Diphthongs (δίφθογγοι) and Vowel Combinations

A diphthong is a combination of vowel sounds that starts as one vowel and, within the same syllable, changes gradually to another vowel.

The diphthongs in Greek are:

Diphthong	Transliteration	Pronunciation	
αι	ai, ae, e	(ai)	*ai*sle, h*i*gh [ī]
αυ	au	(au)	s*au*erkr*au*t
ει	ei, e, i	(ei)	sl*ei*gh [ā]
ευ (also ηυ)	eu	(ε + υ)	
οι	oi, oe, e, i	(oi)	c*oi*n, t*oy*
ου	ou, u	(ou)	s*ou*p [oo]
υι	ui	(uy)	(cf. N*ew* Y*o*rk)

(The combination υι in Attic Greek always occurs before another vowel and is pronounced as υ followed by the semi-vowel *y*; there is no exact English equivalent.)

3. The Long Diphthongs: Iota-subscript

When a long vowel (ᾱ, η, or ω) combines with ι to form a diphthong, the ι is (in most modern texts) written under the line: this is called iota-subscript or ι-subscript, ᾳ, ῃ, ῳ. This is not an ancient custom, but dates from the Byzantine Age, when scholars were attempting to standardize the spelling of ancient Greek, although the pronunciation had changed over the years. Most but not all modern texts follow the Byzantine practice.

Note on ι-subscript

In the Classical period, and in fact until the ninth century C.E., the capital letters were used for all formal writing. The small letters are simplified forms of these for faster writing, and began in the ninth century C.E. to be used as a formal (or book) hand. Before this time the long diphthongs were written with iota on the line with the other letters: AI, HI, ΩI, as in THI ΚΩΜΩΙΔΙΑΙ, THI ΤΡΑΓΩΙΔΙΑΙ (τῇ κωμῳδίᾳ, τῇ τραγῳδίᾳ *for the comedy, for the tragedy*), and iota was pronounced: spelling originally represents pronunciation (i.e., language), but often becomes standardized (or fossilized) as pronunciation changes.

By the second century B.C.E. this iota had been lost from the pronunciation in Attica, and it gradually ceased to be written. The Byzantines put it under the line to show that it no longer affected the pronunciation. When this little iota occurs, it must be learned as part of the spelling. Thus, it is necessary to distinguish -ῃ (a dative ending) from -η (a nominative ending). After a capital letter, this ι is still written on the line in modern texts, Αι, Ηι, Ωι (= ᾳ, ῃ, ῳ).

Breathings

1. In Greek, the symbol ', though not a letter, represents one of the sounds of the language, the *h*-sound (or aspiration).

2. Every word beginning with a vowel or diphthong must be marked with either the ' (rough breathing for *h*) or the ' (smooth breathing for the absence of an *h*): εἰς (eis) *into;* εἷς (heis) *one;* ὀδός (odos) *threshold;* ὁδός (hodos) *road*. The breathing mark goes over the second member of a diphthong: οὐ *not;* οὗ *of whom*.

3. Words beginning with ρ and υ always have the rough breathing: ῥόδον *rose;* ὑπέρ *over* (hyper).

Note on the Breathings

The alphabet given above is the Ionic alphabet, which was the one used by the Ionian Greeks and adopted by the Athenians (officially in 403 B.C.E.), and gradually by all the Greeks. Before this universal acceptance of the Ionic alphabet, a city-state might not only have its own dialect, but some even had their own versions of the alphabet. Now the Ionic alphabet is the one used both for Modern Greek and for classical Greek texts. The old Attic alphabet (and some others as well) used the H symbol for the *h*-sound (the aspiration), but the Ionians used the same symbol to represent the long *e*-sound: in their dialect, speakers tended to drop their *h*'s. In some places, a new symbol was developed to represent the *h*-sound, at first used only to differentiate words that were otherwise the same—such as ὅρος (horos) *boundary* from ὄρος (oros) *mountain*—but later adopted universally. This symbol was developed from the H, by splitting it in half: ⊢ (used in inscriptions from the Greek colonies in Southern Italy, ⊢ορος). It was later adopted in the form ˪ by the Alexandrian scholars from which it developed into our ', the rough breathing (πνεῦμα δασύ *hairy breath*). The Alexandrian grammarians also introduced the complementary ⊣ (which became ˩ and then ') to indicate the absence of aspiration (calling it πνεῦμα ψιλόν *plain breath, bald breath*) again to indicate the correct reading of words otherwise spelled the same. It is now conventional to mark every word beginning with a vowel or diphthong with a rough (') or smooth (') breathing. It must be learned as part of the spelling of the word. It is written beside (to the left of) a capital letter: 'Η, 'Η, Ἀ, Ἀ.

The rough breathing is pronounced and transliterated as the letter *h;* the smooth breathing is not heard and is not transliterated.

Ὀρέστης, *Orestes* Ὅμηρος, **Homer*

*Note: in English the endings of personal names are often dropped.

The rough breathing is also used over an initial ρ, to indicate that it is aspirated. We represent this by trilling the ρ and transliterating ῥ as *rh:* ῥήτωρ (rhetor), *orator*.

Classification of Consonants

The consonants (σύμφωνα) are divided into **Mutes** (or stops) and **Continuants** (including liquids, nasals, a spirant, and double consonants).

There are nine **Mutes** (ἄφωνα), divided according to (1) where they are produced, into labials, dentals, and palatals; and (2) the effort in breathing, into unvoiced, voiced, and aspirated (or rough).

The following chart shows the two classifications:

	Unvoiced	Voiced	Aspirated	Produced With
Labials	π	β	φ	the lips
Palatals	κ	γ	χ	the soft palate and tongue
Dentals	τ	δ	θ	the teeth and tongue

Unvoiced or voiceless (ψιλά) consonants are produced without vibration of the vocal cords.

Voiced consonants (called μέσα in Greek) are produced with vibration of the vocal cords: the difference between τ and δ, or κ and γ, or π and β (*t* and *d*, or *k* and *g*, or *p* and *b*) can be felt if you place your fingers on your Adam's apple; you will feel δ, γ, and β, but not τ, κ, π.

Aspirated (δασέα) consonants are followed by a blast of air, or the *h* sound (῾), the rough breathing in Greek.

Note on the Aspirated Consonants

The three aspirates, φ, θ, χ, are equivalent to the three unvoiced mutes π, τ, κ plus the *h* sound. This means that they are pronounced more or less as follows: φ like *ph* in flo*p-h*ouse; θ like *th* in po*t-h*ead; and χ like *kh* in bloc*k-h*ead; except that in Greek the two sounds would be in the same syllable. Actually in English our initial *p* is aspirated (and so probably very much like Greek φ): if you hold your hand in front of your mouth when saying *put* or *pot*, you will feel a blast of air (which is the aspiration). Then try *spot* or *stop*, and you will find that *p* in these positions is much less heavily aspirated. The same is true of English *t* and *k* sounds, as in *top, stop; cat, scat.* English does not make the distinction in spelling between these two variants of *p, t, k,* but Greek does. An English speaker would have difficulty in hearing the difference between π and φ, τ and θ, κ and χ in the ancient pronunciations of these letters. Knowing that φ = π῾ ; θ = τ῾; χ = κ῾ will be helpful later on.

The **Nasals.** There are three nasals in Greek: μ (a labial nasal), ν (a dental nasal), and nasal γ (a palatal nasal).

Nasal γ: when γ occurs before another palatal (i.e., γ, κ, χ, or ξ), it is pronounced *ng* (as in si*ng*):

Example	Translation	Description
ἄγγελος	*messenger* (angel)	γγ as in a*ng*er.
ἀνάγκη	*necessity*	γκ as in i*nk*, a*nk*le
σύγχορος	*partner in the chorus*	γκ as in si*nk-h*ole, Ba*nkh*ead
Σφίγξ	*Sphinx*	γξ as in i*nks*, Sphi*nx*

The **Liquids** are ρ and λ.

The only **Spirant** in Greek is σ. Note that sigma at the end of a word is written ς, anywhere else σ. Some modern editors print the open or lunate form (c) found in papyri for sigma in all its positions.

The **Double Consonants** (διπλᾶ): ζ, ξ, and ψ, are each two consonant sounds represented by one letter.

Labial mutes combine with sigma to become ψ: π, β, or φ + σ > ψ.

Palatal mutes combine with sigma to become ξ: κ, γ, or χ + σ > ξ.

The symbol ζ represents the sound combination σδ. There is, however, some dispute over the pronunciation of this letter: it may originally have indicated the sound *dz* and it is pronounced in this way by most English-speaking Greek scholars. The continual change in language often makes it difficult to find exactly how a given letter was pronounced at a given time: either combination (*sd* or *dz*) is acceptable for classroom use.

Aristotle

Physics

Book II Chapter 3

Translated by Joe Sachs

These things having been marked out, it is necessary to examine the causes, both what sort there are and how many in number. For since this work is for the sake of knowing, but we think we do not yet know each thing until we have taken hold of the why
20 of it (and this is to come upon the first cause), it is clear that we too must do this about both coming into being and passing away and about every natural change, so that, once we know them, we may try to lead back to them each of the things we inquire about.

One way cause is meant, then, is that out of which something comes into being, still being present in it, as bronze of a statue or silver of a bowl, or the kinds of these. In another way it is the form or pattern, and this is the gathering in speech of the what-it-is-for-it-to-be, or again the kinds of this (as of the octave, the two-to-one ratio, or generally number), and the parts that are in its articulation. In yet another it is that whence the first
30 beginning of change or of rest is, as the senator is a cause, or the father of a child, or generally the maker of what is made, or whatever makes a changing thing change. And in still another way it is meant as the end. This is that for the sake of which, as health is of walking around. Why is he walking around? We say "in order to be healthy," and in so saying think we have completely given the cause. Causes also are as many things as come
195a between the mover of something else and the end, as, of health, fasting or purging or drugs or instruments. For all these are for the sake of the end, but they differ from one another in that some are deeds and others tools.

The causes then are meant in just about this many ways, and it happens, since they are meant in more than one way, that the non-accidental causes of the same thing are also many, as of the statue both the art of sculpture and bronze, not as a consequence of anything else but just as a statue, though not in the same way, but the one as material and the other as that whence the motion was. And there are also in a certain way causes of one another, as hard work of good condition and this in turn of hard work, though again not
10 in the same way, but the one as end and the other as source of motion. Further, the same thing is a cause of opposite things. For the present thing is responsible for this result, and we sometimes blame this, when it is absent, for the opposite one, as the absence of the pilot for the ship's overturning, whose presence was the cause of its keeping safe. But all the causes not being spoken of fall into four most evident ways. For the letters of syllables and the material of processed things and fire (and such things) of bodies and parts of a whole and hypotheses of a conclusion are causes as that out of which, and while the one
20 of each of these pairs is a cause as what underlies, such as parts, the other is so as the what-it-is-for-it-to-be, a whole or composite or form. But the semen and the doctor and the senator, and generally the maker, are all causes as that whence the source of change or rest is, but other things as the end or the good of the remaining ones. For that-for-the-

sake-of-which means to be the best thing and the end of the other things, and let it make no difference to say the good itself or the apparent good.

The causes then are these and so many in form, but the ways the causes work are many in number, though even these are fewer if they are brought under headings. For
30 cause is meant in many ways, and of those of the same form, as preceding and following one another. For example, the cause of health is the doctor and also the skilled knower, and of the octave the double and also number, and always comprehensive things in relation to particular ones. Further, there is what is incidental, and the kinds of these, as of the statue, in one way Polycleitus and in another the sculptor, because it is incidental to the sculptor to be Polycleitus. And there are the things comprehensive of the incidental
195b cause, as if a man were the cause of a statue, or generally, an animal. And also among incidental things, some are more remote and others nearer, as if the pale man of the one with a refined education were said to be the cause of the statue. And all of them, both those meant properly and those incidentally, are meant some as potential and others as at-work, as of building a house, either the builder or the builder building. And similarly to the things that have been said, an account will be given for those things of which the causes are causes, as of this statue or a statue or in general an image, and of this bronze or of bronze or in general of material, and likewise with the incidental things. Further, things
10 tangling these and those together will be said, such as not Polycleitus nor a sculptor but the sculptor Polycleitus.

Nevertheless, all these are six in multitude, but spoken of in a twofold way: there is the particular or the kind, the incidental or the kind of the incidental thing, and these entangled or spoken of simply, and all as either at-work or in potentiality. And they differ to this extend, that what is at-work and particular is and is not at the same time as that of which it is the cause, as this one healing with this one being cured or this one building
20 with this thing being built, but not always so with what is potential. The house and the housebuilder are not finished off simultaneously.

And it is necessary always to seek out the ultimate cause of each thing, and in just the same way as with the others. (For example, a man builds because he is a builder, but is a builder as a result of the house-builder's art; this, then, is the prior cause, and thus with everything.) Further, the kinds belong to the kinds and the particulars to the particulars (as a sculptor to a statue, but this sculptor to this statue.) Also the potentialities belong to the potentialities, but what is at work corresponds to what is being worked upon. How many then are the causes and in what way they are causes, let it have been marked out sufficiently for us.

The following selection is intended for the freshman pre-registration packet, and includes only Chapters 1 and 5. The intervening chapters, to be read afterwards, are in the manual.

Aristotle

On the Parts of Animals

Book I Chapter 1

639[a]2 With regard to every [kind of] contemplation and inquiry, both lowlier and more esteemed alike, there appear to be two ways of being skilled, one of which it is well to call the science of the thing, and the other as it were a kind of educatedness. For it is characteristic of an educated man to be able to hit the mark and judge appropriately what the speaker sets forth finely and what he doesn't. For something like this is in fact what we suppose the generally educated man to be, and that to be educated is to be capable of doing
a10 this very thing - except that we believe that this one, the generally educated man, is able to judge about virtually all things, though being one man, but that the other one is able to judge [only] about some limited nature; for there could be someone else who is disposed in the same manner as the former one, [but] with regard to a part.

So that it is clear that the inquiry about nature must also have some such guidelines, with reference to which one will assess the way in which matters are being presented, even apart from what the truth is, whether it is thus or otherwise.

I mean, for example, the following: Must we take each single being and make determinations about it by itself – treating separately the nature of a man or of a lion or an
a20 ox or something else – or must we posit the attributes that are common to all according to something in common? For many of the same attributes belong to many different genera, such as sleep, breathing, growth, decay, death, and in addition to these any other such affections and dispositions. For what we are in a position to say about these things now is unclear and imprecise. But it is plain that if we speak about the animals in turn we shall often say the same things about many of them. For each of the above-mentioned attributes belongs to horses and dogs and men, so that if someone should speak of their attributes separately, he will be compelled to speak many times about the same ones – as
a30 many as, being the same, belong to animals different in kind, while they themselves have no
639[b]1 difference. But perhaps there are other attributes which happen to be the same in designation, but which differ in virtue of a specific difference, such as the locomotion of animals. For it is apparent that this is not one in species; for there are differences between flying and swimming and walking and creeping. Hence it must not escape our notice how one must make the examination, and by this I mean whether one must first consider general attributes in common, and later those peculiar [to each kind of animal], or whether one should begin at once with each [kind]. For at present this has not been determined, nor has the next question:

Must the student of nature, just as the mathematicians do when they present astronomical matters, first contemplate the appearances with regard to the animals and
b10 their subclasses (i.e., the appearances with regard to each [kind]), and thereupon state the

why and the causes, or must he do otherwise?

And in addition, since we see more than one cause with respect to natural coming to be – for example, the cause for the sake of which and the cause from which the motion has its beginning – one must determine also concerning these, as to which is naturally first and which second. And there appears first the one we call for the sake of something; for this [something] is a [rational] account, and the account is a principle alike both in things constituted according to art and in things constituted by nature. For when the doctor has defined health and the housebuilder the house, either with the mind or with perception,
b20 they offer the accounts and the causes of each thing that they do and why it must be done thus. And the for the sake of which and the beautiful are to a greater degree in the works of nature than in those of art.

That which is from necessity is not present in the same way in all the things that are according to nature. Almost all try to refer their accounts back to this, without having distinguished in how many ways the necessary is spoken of. The simply necessary is present in the everlasting things, but the conditionally necessary is present in everything that comes to be, as in artifacts, such as a house and any other of the things of this sort. It is necessary that material of such a sort be present if there is to be a house or any other
b30 end; and first this must come to be and be set in motion, then this, and successively in this manner up until the end and that for the sake of which each thing comes to be and is. And
640[a]1 it is likewise with things that come to be by nature. But the manner of the demonstration and of the necessity is different in the study of nature and the contemplative sciences. (This has been discussed in other works.) For in the latter, the beginning is what is, whereas in the former it is what will be: 'for since health or man is such, it is necessary for this to be or to come to be,' but not, 'since this is or has come to be, that of necessity is or will be.' Nor is it possible to link together the necessity in such demonstration forever, so as to say that since this is, that is. But these things too have been determined in other
a10 works – in what sorts of things necessity is present and what sorts of necessity are reciprocal, and on account of what cause.

And it must also not escape our notice whether it is appropriate to say, as did our predecessors in contemplation, how each thing naturally comes to be rather than how it is. For the one differs from the other in no small way. But it seems, as we said before, that we must begin from this point, namely, that with regard to each kind of thing one must first grasp the appearances, and only then speak of their causes and concerning coming to be. For in housebuilding too it is more the case that these things happen because the form[1] of the house is of this sort than that the house is of this sort because it comes to be in this way. For the coming to be is for the sake of the being, but not the being for the sake of
a20 the coming to be. Hence Empedocles spoke incorrectly when he said that many things are present in animals because of its happening thus in their coming to be; for example [he said that] the backbone is such because it happened to be broken by twisting. He ignored, first, that an already constituted seed must be present with such a potency; and secondly, that the producer was prior not only in terms of the [rational] account but also in time; for man generates man, so that it is on account of that one's being of such a sort that coming to be happens in this way for this one.

It is similar with the things that are believed to come to be spontaneously, as also with artifacts. For in some instances the same things that come to be from art also come to

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1 The Greek word here, and for the remainder of chapter 1, translated as "form" (♏♑♎□♐) was earlier translated as "species." The translation "species" will again be used in the succeeding chapters.

a30 be spontaneously, such as health. Now for some things the producing agent pre-exists and resembles them, as in the case of the statue-making art; for they do not come to be spontaneously. And the art is the [rational] account of the work without its material. And similarly with the things from chance: as the art has it, so they come to be.

Hence in the best case one should say that since this is [what it is] to be a man, 640[b]1 therefore he has these things; for he can not be without these parts. Failing that, one should speak as closely as possible to this manner, and either say simply that it is impossible otherwise or else that it is fine, at any rate, in this way. And these things follow: because he is such, his coming to be necessarily happens in this way and is such; hence this part comes to be first, and then this. And one should speak in this manner likewise about all the things that are constituted by nature.

Now the ancients who first philosophized about nature used to consider the material principle and that sort of cause – what and of what sort it is, and how the whole b10 comes to be out of it, and what sets it in motion (such as strife or love or intellect or spontaneity) – where the underlying material has some such nature of necessity, as for example fire a hot nature and earth a cold one, and the former a light one and the latter a heavy one. For in this way they generate the cosmos. They speak similarly about the coming to be of the animals and the plants as well. For example, they say that when the water flowed in the body, a hollow stomach came to be, along with every receptacle of both food and residue, and that when the breath passed through, the nostrils broke open. And air and water are the material of the bodies; for out of such bodies they all constitute b20 nature. But if man and the animals and their parts are by nature, one would have to speak about flesh, bone, blood, and all the homogeneous parts, and likewise about the non-homogeneous parts, such as face, hand, foot – in virtue of what, and in respect of what sort of potency, each of them is such as it is. For it does not suffice to say what it is out of, such as fire and earth. It is as if we were speaking about a bed or some other such thing: we would try to determine its form rather than its material, such as the bronze or the wood; but if not the form, at least the material of the whole together. For a bed is a this in this, or such a this, so that we would have to speak about its shape and of what sort it is in its b30 form; for its nature with respect to its conformation is more important than its material nature.

Now if each animal and part is by virtue of its shape and its color, then what Democritus says would be correct; for he appears to assume this. At any rate he says that it is clear to everyone what sort of thing man is in respect to his conformation, on the assumption that he is known by his shape and color. Yet the dead man too has the same 641[a]1 conformation of shape, but nevertheless he is not a man. Further, it is not possible that a hand be constituted in any way whatsoever – of bronze, for example, or of wood – except in name only, as the doctor in the painting. For it will not be able to do its own work, just as stone flutes cannot do their own work, nor the doctor in the painting. Similarly, none of the dead man's parts is such a part any longer; by this I mean for example an eye or a hand. Therefore Democritus has spoken too simply, and in the same way as a carpenter might speak about a wooden hand. For in this way those who give accounts of nature speak about the comings to be and the causes of the shape. For by what potencies were they a10 fashioned? But perhaps the carpenter will answer by saying 'an axe or drill,' whereas the other will say 'air and earth.' But the carpenter will give a better account. For it will not suffice for him to say merely that when the tool fell, one thing became hollow and the other flat. But he will say why he delivered such a blow, and for the sake of what, giving the cause, namely, in order that [the product] might come to be with such or such a

conformation.

It is clear, then, that they do not speak correctly, and that one must say the animal is of such a sort, and that one must speak about that, both what it is and of what sort it is, and about each of its parts, just as one would speak about the form of the bed. Now if this
a20 is soul or a part of soul or not without soul (when soul has departed, at any rate, there is no longer an animal, nor does any of its parts remain the same except in shape alone, like those in the story which were turned into stone), now if this is so, it would be for the student of nature to speak and to know about soul, and if not all soul, then about that [part] of it in virtue of which the animal is of such a sort. And he should speak and know about what the soul, or this very part of it, is and also about the attributes that are in conformity with this its being, especially because nature is spoken of and is in two ways: in one way as material and in the other as being. And this latter is also [nature] as the mover
a30 and as the end. And of this sort, in the animal, is either all the soul or some part of it. So that also for this reason the one who is contemplative about nature would have to speak about soul more than about the material, inasmuch as the material is nature more because of that than the other way around. For also the wood is a bed and a stool because it is potentially these.

But one might be perplexed, looking at what was now said, whether it belongs to the study of nature to speak about all soul or about some [part]. For if about all, then there
641[b]1 remains no philosophy beyond natural science. For the intellect is [the capacity for apprehension] of the intelligibles, so that natural knowledge would be about all things; for it belongs to the same [capacity] to contemplate intellect and the intelligible, if indeed they are relative to one another and if there is the same contemplation regarding all things that are relative to one another, just as in the case of perception and the perceptibles. Or else not all the soul is a principle of motion, nor all of its parts. But the principle of growth is the very [part] which is also in plants; and of alteration, that which is capable of perception; and of locomotion, it is something else and not that which is capable of intellection; for locomotion is present in other animals too, but mind is in none. It is clear, then, that one
b10 should not speak about all soul; for not all soul is nature, but some part of it, either one or more.

Further, it is not possible for the study of nature to contemplate any of the things that exist by abstraction, since nature does all things for the sake of something. For just as in artifacts there is the art, thus there appears in the things themselves another such principle and cause, which we have from the all, as we do the hot and the cold. Wherefore it is more plausible that the heaven has come to be by such a cause, if it has come to be,
b20 and that it is on account of such a cause, than the animals that are mortal. At any rate, the orderly and the definite appear much more in the heavenly things than around us, while the inconstant and the as it happened [appear] more regarding the mortal things. Yet there are those who say that, while each of the animals is and came to be by nature, the heaven was constituted such as it is from chance and spontaneity, even though nothing at all in the heaven appears from chance and disorder. But we say that this [comes to be] for the sake of this in every case where there appears some end which the motion reaches if nothing impedes it. So that [we say] it is clear that there is some such thing, which indeed we call
b30 nature. For it is not any chance thing that comes to be out of each seed, but this comes out of this, nor does any chance seed come out of any chance body. Therefore the seed is the principle and the productive agent of that which comes out of it. For these things are by nature [φυσει]; at any rate, they grow [φυεται] out of this. Yet still prior to this is that of

which it is the seed. For the seed is a coming to be, but the end is being. But still prior to
642[a]1 both is that from which the seed comes. For it is the seed in two ways, as that out of which and as that of which: it is the seed of that from which it came, such as a horse, and of that which will be out of it, such as a mule, not in the same manner, but of each in the way we said. Further, the seed is [something] in potency, and we know how potency is related to fulfillment.

There are, then, these two causes, the for the sake of which and the from necessity. For many things come to be because of necessity. But perhaps someone might be perplexed as to what sort of necessity is meant by those who say 'from necessity.' For
a10 neither of the two manners of necessity defined in our philosophical works can be present. But there is the third one, which is present in the things that come to be. For we say that food is something necessary in neither of these two manners, but because [the being] cannot be without this. This is, as it were, conditional. For just as it is necessary for the axe to be hard, since one must split wood with it, and if it is hard, for it to be of bronze or iron, so too, since the body is an instrument (for each of its parts is for the sake of something, and likewise the whole), it is therefore necessary for it to be of such a sort and out of such things, if that [end] will be.

It is clear, then, that there are two manners of cause, and that in our statements we
a20 must in the best case hit upon both, or if we don't, that we must at least try to make [this] clear, and that all those who do not say this say nothing, so to speak, about nature. For nature is a principle more than the material is. On some occasions, even Empedocles stumbles upon it, being led by the truth itself, and he is compelled to say that the being and the nature [of a thing] are the [rational] account, for example in explaining what bone is. For he does not say that it is some one of the elements itself, nor two or three, nor all of them; but he says that it is the account [i.e., the ratio] of their mixture. It is clear, then, that flesh too and each of the other such parts exists in the same manner. The reason why
a30 previous generations did not arrive at this manner of cause is that there was no notion of the what it is to be and no defining of being. But Democritus was the first to touch upon it, not because he thought it necessary for the contemplation of nature, but because he was carried away by the thing itself. In Socrates' time this [interest] grew; but inquiry into the things having to do with nature came to a halt, and those who were philosophizing turned aside toward useful virtue and political [science].

The exposition should, for example, be as follows: breathing is for the sake of this, but it comes to be of necessity on account of these things. And 'necessity' signifies
642[b]1 sometimes that if that, the for the sake of which, will be, it is necessary to have these things. But sometimes it signifies that such is their state and their nature. For it is necessary for the hot to go out and to come back in when it strikes against something, and for the air to flow in. This is already necessary. And since in the cooling the hot within offers resistance, there is the inflow of the air from without and the outflow. This, then, is the manner of the inquiry, and these and such things are those about which one must grasp the causes.

Chapter 5

Of the beings constituted by nature, [we say that] some are ungenerated and incorruptible throughout all the ages, while others have a share in coming to be and perishing. And it has come about that the former, which are esteemed, and indeed divine, offer us fewer occasions for contemplation (for both regarding the starting points from
b30 which one might examine them, and also regarding the things which we yearn to know, there is altogether very little that is manifest to perception). But we are better off with respect to knowledge of the perishable plants and animals because they grow up with us. For anyone willing to work hard enough would grasp much about each of the existing kinds.

Each of the two groups has its charm. For even if we touch only a little upon the
645[a]1 former ones, nevertheless on account of the value of knowing them, there is more pleasure than from all the things around us, just as to glance at a chance and small part of those we love is more pleasant than to see with precision many other great things. But the latter, because we are better and more plentifully informed about them, have the advantage with respect to science. Further, because they are nearer to us and more akin to our nature, they have their own compensations in comparison with the philosophy concerning the divine things. And since we have gone through our account of what appears to us with regard to those things, it remains to speak about animal nature, omitting nothing to the extent of our
a10 power, whether it is less esteemed or more so. For even in the case of those of them that are unattractive to perception, nevertheless when it comes to contemplation, the nature that fashioned them provides extraordinary pleasures to those who are able to know their causes and who are philosophers by nature. For it would be unreasonable, indeed absurd, if we delighted in contemplating their likenesses, because we are contemplating at the same time the art that fashioned them (such as painting or sculpture), but didn't welcome even more the contemplation of the beings themselves constituted by nature, at least if we are able to survey their causes. Wherefore we must not have a childish disgust at the
a20 examination of the less esteemed animals. For in all the natural things there is something wondrous. And just as Heraclitus is said to have spoken to the visitors, who wanted to meet him but who stopped when they saw him warming himself at the stove – for he urged them to enter with confidence, for 'there are gods here too' – so we should also approach the inquiry about each of the animals without aversion, on the grounds that in all of them there is something natural and beautiful.

For the not by chance, but for the sake of something, exists most of all in the things of nature; and the end for the sake of which they have been constituted or have come to be occupies the place of the beautiful. But if anyone holds that the contemplation
a30 of the other animals is valueless, he ought to think in the same way about himself too. For it is not possible without much disgust to look at the things from which the human kind is constituted, such as blood, flesh, bones, blood vessels, and parts such as these. And just as in a discussion of any parts or implements, one must not hold that it is the material that is being mentioned, or that the discussion is for the sake of this, but that it is for the sake of the whole conformation – for example a house, but not bricks and mortar and timber –
645[b]1 likewise one must hold that the discussion about nature is about the composition and the whole being, not about those things that never occur in separation from the being they belong to.

It is necessary first to distinguish, with respect to each kind, the attributes that belong in virtue of themselves to all the animals, and after this to try to distinguish their

causes. Now it was previously said that many attributes belong in common to many of the animals, some simply – as feet, feathers, scales, and affections too in the same way – but
b10 others analogously. (By 'analogously' I mean that some have lungs, while others have not lungs but something else which is to them what lungs are to the former; and some have blood, while others have the analogue, which has the same potency that blood has in those with blood.) And to speak separately about each of the particulars will result, as we said before, in our often saying the same things, since we are speaking about all the attributes, but the same ones belong to many. Let this, then, be determined in this way.

Since every instrument is for the sake of something, and each of the parts of the body is for the sake of something, and that for the sake of which is some action, it is clear
b20 that the whole body too is constituted for the sake of some complete action. For sawing has not come to be for the sake of the saw, but the saw for the sake of sawing; for sawing is a kind of using. So that the body too is somehow for the sake of the soul, and the parts for the sake of the functions for which each is naturally constituted. Therefore, we must first state the actions, those which are common to all, those that are generic, and those that are specific. By 'common' I mean those which belong to all the animals. By 'generic' I mean those which belong to animals whose differences from each other we see as being differences in degree. For example I speak generically of bird, but specifically of man and of everything that has no differences with respect to its general account. For some have
b30 what is common by analogy, some generically, and some specifically.

Now in the case of actions that are for the sake of other actions, it is clear that the [parts] of which they are the actions differ in the same manner as the actions. Likewise if some actions are in fact prior and the end of other actions, each of the parts of which these
646ª1 are the actions will have the same priority. And thirdly, there are those things because of whose existence it is necessary [for other things] to be present. By 'affections' and 'actions' I mean coming to be, growth, copulation, waking, sleep, locomotion, and as many other such things as belong to animals. By 'parts' I mean nose, eye, and the face as a whole, each of which is called a member. And similarly with the others.

Let this much be said about the manner of our inquiry. And let us try to state the causes, both of the common [attributes] and of those peculiar [to each kind of animal], beginning, as we have determined, from the first things first.

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