JOHN PAUL THE GREAT CATHOLIC UNIVERSITY

PHILOSOPHY OF NATURE
Course Reader #1

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Table of Contents

Essay on *Enuma Elish*
Fr. Andrew Younan 1

Genesis 1-2
Revised Standard Version 14

Parts of Animals I.1, 5
Aristotle 18

The Principles of Nature
St. Thomas Aquinas 31

From *The Mesopotamian School and Theodore of Mopsuestia*

Fr. Andrew Younan

Mesopotamian Cosmology – Enuma Elish

The precise nature of the Babylonian "Epic of Creation" is not, strictly speaking, that of a book of cosmology. It is more accurately described as a story about Marduk and his ascent to the head of the Babylonian pantheon, wherein the creation of the world is described as a sub-story.[1] Still, the creation story within the *Enuma elish* is "the principal source of our knowledge of Mesopotamian cosmology."[2] Nor are we in any sense "forced" to rely on the Epic merely because there has been little else discovered by way of "creation stories" in Mesopotamia – though the creation account makes up only a small portion of the *Enuma elish*, it is still, according to Jacobsen, "a very remarkable attempt at coming to terms with, at understanding, and at accepting the universe."[3]

The Creation Epic, as it is often called, was written sometime between 1200 and 1600 B.C.[4] It was used, most likely, as the text of a kind of liturgical service on the New Year Festival on

[1] See Alexander Heidel, *The Babylonian Genesis* (Chicago: Phoenix Books, 1951), 10-11: "*Enuma elish* is not primarily a creation story at all. If we were to put together all the lines which treat of creation, including the theogony and even granting that most of the missing portion of Tablet V deals with works of creation, they would cover not even two of the seven tablets but only about as much space as is devoted to Marduk's fifty names in Tablets VI and VII….*Enuma elish* is first and foremost a literary monument in honor of Marduk as the champion of the gods and the creator of heaven and earth…the story of the creation of the universe, was added not so much for the sake of giving and account of how all things came into being, but chiefly because it further served to enhance the glory of Marduk and helped to justify his claim to sovereignty over all things visible and invisible."

[2] Ibid., 10.

[3] Jacobsen, 167. See also N. K. Sandars, *Poems of Heaven and Hell from Ancient Mesopotamia* (New York: Penguin Books, 1971), 11: "[*Enuma elish*] is about the foundation of the world and of the foundation of Babylon, the great city, the world's center."

[4] Bottero affirms the former (242) and Stephanie Dalley the latter in *Myths from Mesopotamia* (New York: Oxford University Press, 1989), 229.

what is now April 4th.[5] It is not, however, so much the practical use of the poem as its underlying teachings about the universe that concern us here. Assuming that this piece of literature, like the Gilgamesh Epic and any piece of literature, reflects the attitudes and genius of its time and place, what can we learn about the Mesopotamian mind from this work? I would ask three questions, and in turn produce three answers, regarding this text: first, *what is it in the cosmos which is conspicuous enough to require divine explanation?* Second, *in what terms is the material element of the physical world explained?* Finally, *how was the world as we now know it actually brought into being, and what does this tell us about how we humans should approach it?*

The creation of the world takes place in Tablet V of the Epic, and occurs after a great battle whereby Marduk, a young but powerful god, defeats and kills Tiamat, the second "oldest"[6] of the gods after Apsu and mother of all, who had existed eternally, as we learn from the first lines of the Epic:

> When the skies above were not yet named
> Nor earth below pronounced by name,
> Apsu, the first one, their begetter
> And maker Tiamat, who bore them all…
> Had mixed their waters together,
> But had not formed pastures, nor discovered reed-beds;
> When yet no gods were manifest,
> Nor names pronounced, nor destinies decreed,
> Then gods were born within them.[7]

After the youngest gods are engendered, and prove themselves too rowdy for their parents, Apsu angrily attempts to silence them and is killed by Ea. Ea then sets up his abode atop of Apsu (the Akkadian

[5] See Sandars, 39: "So much is known about the New Year spring festival at Babylon that we can go a long way towards reconstructing the actual scene when, on the evening of the fourth day of the month Nisan (April), the priest of Marduk stood in an inner room alone in front of the figure of the god, to chant the entire creation poem."

[6] It is not clear whether Tiamat and Apsu *had* a beginning, or even whether temporality can be applied at all to any of the events in the Epic. This will be discussed in greater detail later.

[7] Dalley, 233.

word for "abyss"), and he and his lover Damkina give birth to the greatest of the gods, Marduk.[8] During this battle, Tiamat had played the part of a good mother, attempting to appease Apsu's wrath. After her husband is killed, however, and the young Marduk awakes her and the older gods once again with his exuberance, she is more easily angered and moved to battle. The next few tablets describe the preparations for battle on both sides and the battle itself, but what concerns us here is that, after his victory, Marduk uses the body of Tiamat to create an abode for himself and the other gods. This is the context of the creation story in *Enuma elish*.

It is here that we may ask our first question: *what is it in the cosmos which is conspicuous enough to require divine explanation?* This is a relevant question – even *the* relevant question because there are so many possible answers that the ones chosen by the author of *Enuma elish* reflect immediately what his mind was concentrating on, what it found interesting and noteworthy – even surprising and wondrous - about the world. "[Marduk] divided the monstrous shape and created *marvels*…"[9] What, then, were these marvels that Marduk created? Tablet V begins:

He fashioned stands for the great gods.
As for the **stars**, he set up **constellations**
corresponding to them.
He designated the **year** and marked out its divisions,
Apportioned three stars each to the **twelve months**.
When he had made plans of the days of the year,
He founded the stand of Neberu to mark out their courses,
So that **none of them could go wrong** or stray…
With [Tiamat's] liver he located the Zenith;
He made the crescent **moon** appear, entrusted night (to it)
And designated it the jewel of night to mark out the days.
'Go forth **every month without fail** in a corona,

[8] Ibid., 235: "[Ea] held Apsu down and slew him…He set his dwelling on top of Apsu…And inside Apsu, Marduk was created; Inside pure Apsu, Marduk was born."

[9] Ibid., 255.

At the beginning of the month,
to glow over the land.
You shine with horns to mark out six days;
On the seventh day the crown is half…
The spittle of Tiamat Marduk put into groups
and made **clouds** scud.
Raising **winds**, making **rain**,
Making **fog** billow, by collecting her poison,
He assigned for himself and let his own hand control it.
He placed her head, heaped up [ ]
Opened up **springs**: water gushed out.
He opened the **Euphrates** and the **Tigris** from her eyes…
He piled up clear-cut **mountains** from her udder,
Bored waterholes to drain off the catchwater…
He set her thigh to make fast the **sky**,
With half of her he made a roof; he fixed the **earth**…[10]

The phenomena which are explained in this creation story fall into two categories: temporal cycles and objects in nature. In the first category we find the arrangement of years and months, the cycles of the sun and moon. In the second category we find cloud, wind, rain, springs, the great rivers, mountains, and the heavens and the earth themselves.

Regarding the explanation of temporal cycles, we may ask specifically what it was that was interesting enough about, for example, the waxing and waning of the moon that required a divine explanation? The answer is given in two separate lines: "…so that none of them could go wrong…" and "…every month without fail." It is precisely the *reliability* of the lunar and solar cycles that are conspicuous enough to the Mesopotamian to require a mythological explanation. Similarly with physical phenomena, it is *the very fact of their existence* that seems to demand an explanation. Nor is this an insignificant or redundant point: of all the possible aspects of reality interesting enough to draw the attention of the Mesopotamian, darkness, destruction, death, silence, emptiness, pain, etc., it is specifically the *positive* aspects that actually draw it. It is as if the total contingency of the universe

[10] Ibid., 255-257, selected verses. Emphasis mine.

is recognized, and nothing, not even existence itself, is taken for granted.[11] For the Mesopotamian, then, the basic attitude toward physical reality is one of positive acceptance, *wonder* or even *gratitude*.

In asking our second question, in what terms the physical constitution of the cosmos is explained in the Mesopotamian tradition, we look to the same passage quoted above, only through a different lens. The wondrous things in nature are only half explained by the creative activity of Marduk; he is their creator, but he did not create *ex nihilo*: their primal source – the ultimate material cause of the universe – is the body of the defeated goddess Tiamat. Here there is a marked contrast between the early Mesopotamian and much of the later ancient world's attitude toward physical reality: where the Manichean or Plotinian would have described matter as low or even evil, the Mesopotamian, gazing upon the physical universe with wonder, has no recourse but to assign *to matter itself* a divine "material."

This being the case, it is noteworthy that the Mesopotamian therefore would not have seen matter – or its divine source Tiamat – to have ever had a "beginning" of any kind: the opening lines of the Epic quoted above testify to that. N. K. Sandars explains this in the introduction to her translation of the Epic:

> At the end of the poem all three primordial existences, Tiamat-Apsu-Mummu, have been defeated; they are 'dead' or, like Mummu, locked away. But for the Babylonians the material world was eternal; nothing is ever wasted in this thrifty universe, not even death. We know this also from Diodorus Siclulus, the Greek geographer who was born in the first century B.C. 'The Chaldeans say that the substance of the world is eternal, and that

[11] See Dalley's Introduction to her translation of the Epic, 228: "The forces of evil and chaos are overcome, whereupon the present order of the universe can be established, with its religious centres, its divisions of time, its celestial bodies moving according to proper rules, and with mankind invented to serve the gods. The gods themselves behave in an orderly fashion."

> it neither has a first beginning nor…will at a later time suffer destruction.[12]

To see the physical world as eternal is to see it with drastically different eyes from those of any modern American trained and taught by popular science to think of the "beginning" of the world as the Big Bang. Indeed, this fundamental difference in cosmological doctrine seems to reflect a – or even *the* – fundamental difference in philosophical perspective in one's approach to the world.[13]

There also seems to be a connection between anthropology and cosmology in the Epic. The creation of human beings occurs in much the same way as that of the rest of the cosmos; out of a particular need of the gods, Marduk uses parts from a deceased god to create. In the case of the cosmos, the gods wanted a place to live, and so Marduk used Tiamat's body as material for the world. In the case of human beings, the gods wanted servants to work for them and allow them to live a life of

[12] Sandars, 28. She goes further on 61: "In the Babylonian poem there is, strictly speaking, no creation at all. Matter is eternal, Tiamat and Apsu provide, from within themselves, the material of the whole universe."

[13] Sandars concludes her introduction (70): "We can choose today between Continuous Creation and the Big Bang, and the ancient world had the same choice. Creation of the universe *ex nihilo* by Yahweh was a cataclysmic physical event as much as any Big Bang, or series of bangs which may still be whispering round the universe; while the cyclical turnings of time, and the eternal uncreated matter of the Babylonian cosmography, perpetually evolving into greater complexity yet liable to regress into a simpler state, has its counterpart in Continuous Creation. Whatever the nature of the difference, whether theological of physical, it surely represents at bottom a difference of psychological, or mental, tone. We do not know the reason but it is very probably that the antinomy was there from the first beginning of man's thoughts about beginnings." I would like to return to this theme periodically throughout this thesis: that what I call the Mesopotamian School represents or even is merely a representation one of the two primordial and fundamental approaches to the world by the human mind. This will become most evident in the later discussion on Alexandria as the cultural center which later embodies the *other* primordial approach. It will be useful then to describe the two in parallel in order especially to give our School more precise definition by contrast, but for the sake of space the Egyptians must be constricted to one section only.

leisure, and Marduk uses the blood of Kingu, the head of Tiamat's army of gods, to create humanity:

'Let me put blood together, and make bones too.
Let me set up primeval man: Man shall be his name.
Let me create primeval man.
The work of the gods shall be imposed on him,
And so they shall be at leisure.'[14]

The refinement of the anthropology of the Epic is impressive: though human beings are made from the blood of a god, they are mere servants; though they are mere servants, the work they do is the very work of the gods. The case is the same, though slightly more complex, in the *Ahra-hasis* epic, where Enlil and Mami make humanity, for the same purpose as that described in *Enuma elish*, out of a mixture of a dead god's blood, clay and divine spittle.[15] We will find this motif, that human beings are *by nature* a mixture of greatness with lowliness, throughout Mesopotamian thought, finding its highest expression in Narsai. But the insight here is this: that there seems to be a connection, even a causality, between a basic, heartfelt acceptance of the precariousness of the human condition and an attitude of wonder and gratefulness toward the word. Realism and humility, in other words, lead to wonderment and joy in everyday life.[16]

Not only is the physical universe gazed upon with wonder as made from the body of the oldest goddess, it is also the abode of many of the gods themselves:

Then Marduk the king divided the gods,
The Anunnaki, all of them, above and below.

[14] Dalley, 260-261.

[15] W. G. Lambert, "Myth and Ritual as Conceived by the Babylonians," *Journal of Semitic Studies* 13:1 (1968): 104.

[16] The sentiment is expressed beautifully by Chesterton: "The whole point depends upon [man's] being at once humble enough to wonder and haughty enough to defy…We must have in us enough reverence for all things outside us to make us tread fearfully on the grass. We must also have enough disdain for all things outside us, to make us, on due occasion, spit at the stars…Man must have just enough faith in himself to have adventures, and just enough doubt of himself to enjoy them." *Orthodoxy* (San Francisco: Ignatius Press, 1986), 318.

He assigned his decrees to Anu to guard,
Established three hundred as a guard in the sky;
Did the same again when he designed
the conventions of earth,
And made the six hundred dwell
in both heaven and earth.[17]

Many of the gods, three hundred to be exact, live on earth. Even "heaven" here may – and most probably does – refer to the physical sky rather than a spiritual abode. For the Mesopotamian, there is no separation, or even distinction, then, between the world of the gods and our physical world here on earth. Babylon itself was built, according to our Epic, to be an abode for the gods. Jacobsen summarizes: "Marduk's first demand upon the gods was that they build him a city and a house to serve as a permanent royal administrative center and a place for them to stay when they gathered for an assembly: a signpost to permanence. Its name was to be Babylon…They suggested that they themselves move to Babylon."[18] Marduk grants the request of the Anunnaki, the builders of Babylon: "'Indeed, Bab-ili[19] is your home too! / Sing for joy there, dwell in happiness!' / The great gods sat down there, / and set out the beer mugs; they attended the banquet."[20]

This basic identity between the world of the gods and the world of human beings has given scholars certain insight into the practical use for the Epic of Creation in liturgical service as well as a possible theory as to the inspiration of the creation story itself. As for the first, Sandars describes the liturgy in which the Epic was read as not only a re-creation but even a repetition of the legendary events narrated thereby: "Continual mental and ritual activity were needed simply to hold the world in equilibrium. Marduk's battle must be fought year after year. Tiamat is never entirely conquered…" She continues: "Earth mirrors heaven, and the earthly liturgy echoes the heavenly. *Ubshukinna*, the Chamber of Destiny, timeless, divine, is also a room of Marduk's brick palace

[17] Dalley, 262.

[18] Jacobsen, 180.

[19] "Bab" is Akkadian for "gate and "ili" the genitive of "ilu," "gods," and therefore "Bab-ili" means "gate of the gods."

[20] Dalley, 263.

beside the Euphrates; a mound of earth in which you can dirty your shoes today. The great *ziggurat* of Babylon was called the *Etemenanki*, the 'House of the Foundation of Heaven and Earth,' the common term for the whole universe, which indeed it was…"[21] Concurrently, Jacobsen describes the physical phenomenon which may have inspired our author's explanation of the creation of the world:

> The speculations by which the ancient Mesopotamian sought to penetrate the mystery of origins were based, apparently, on observations of how new land came into being. Mesopotamia is alluvial, formed by silt brought down by the rivers. It is the situation at the mouth of the rivers where the sweet waters, Apsu, flow into the salt waters of the sea, Tiamat, and deposit their load of silt, Lahmu and Lahamu, to form new land that has been projected backward into the beginnings.[22]

If this theory is true, it gives us another insight into the Mesopotamian psyche: the physical world and its observable activities today are important enough to tell us even about the creation of the world by the activities of the gods ages ago. Indeed, there is nothing in the documents we have today to suggest that the question "where were the gods when they created the world?" was ever even asked. This should suffice to show that there was, for the Mesopotamian mind, only one world, a physical one, in which both the gods and human beings dwelt.

Our third question was *how was the world as we now know it actually brought into being, and what does this tell us about how we humans should approach it?* We have discussed already how the physical world was brought into being from the body of Tiamat and through the agency of Marduk. Scholars interpret this tension between the old gods and the young, the sleeping and the rowdy, as a personification of the universal principles of Rest and Activity. Heidel summarizes the conflict in the Epic:

[21] Sandars, 38-39.

[22] Jacobsen, 169.

> The younger gods, being full of life and vitality, naturally enjoyed noisy, hilarious gatherings. These, however, caused serious distress to their old, inactive, and rest-loving parents and grandparents, Apsu and Tiamat. Peaceful means were tried to diminish the disturbing clamor, but without success.[23]

Upon this first and most fundamental conflict in the Epic, Jacobsen builds an impressive theory regarding the Mesopotamian's perception of reality. The older powers, Apsu and Tiamat, as we said before, stand for "inertia and rest," while Marduk and his generation stand for "energy and movement."[24] Jacobsen's entire interpretation, involving the historical-political atmosphere of Babylon around the time of the Epic's composition, need not concern us here, except to say that the meaning of the universe for the Mesopotamian, according to Jacobsen, is found in seeing *in the physical world itself* a distinction between inertia and activity.[25]

This distinguishing facility of the Mesopotamian mind works elsewhere, according to Jacobsen, and is of its very essence:

> The characteristic Mesopotamian boundness to the externals of situations in which the Numinous was encountered not only tended to circumscribe it and give it intransitive character, it also led to differentiation. The Numinous was the indwelling spirit and power of many phenomena and

[23] Heidel, 4.

[24] Jacobsen, 183.

[25] Ibid., 191: "As a view of world order this is in many ways impressive. It sees the universe as grounded in divine power and divine will: even those wills traditionally felt as older, more authoritative, or hostile, are unified under the leadership of a single ruler who governs through consultation, persuasion, and conviction. It is religiously of great profundity, leading in its picture of Marduk toward the aspects of awe and majesty. Moreover, it is intellectually admirable in providing a unifying concept of existence: political order pervades both nature and society. Finally, it is humanly satisfying: ultimate power is not estranged from mankind, but resides in gods in human form who act understandably. The universe is now moral and meaningful and expression of a creative intelligence with valid purpose: order and peace and prosperity."

> situations and it differed with each of them. Thus ancient Mesopotamian religion was conditioned to a pluralistic view, to polytheism, and to the multitude of gods and divine aspects that it recognized. Plurality of numinous power requires the ability to distinguish, evaluate, and choose; and here also the ancient Mesopotamian leaned heavily on external situation.[26]

This ability to see and differentiate *in the external situation itself* a real power and meaning allowed the Mesopotamian the intellectual freedom to speculate profoundly about the world around him, while still keeping his speculations in check by constantly grounding them to the physical situation before him.

Before concluding this section, it is worthwhile to examine in this context the phenomenon of *divination*, the belief that an observation of physical substances and events can lead to a real knowledge of the future. It is easy to see why, in the context of such a world vision as that presented by the *Enuma elish*, the Mesopotamian sage would pay close attention to physical events or oddities: if the government of the world is accomplished by the gods themselves, and if the gods have meaning, then the events brought about by their government must have meaning, even if it is not immediately comprehensible to us. The way to *make* seemingly trivial events comprehensible was, for the Mesopotamian, closer observation. Bottero states: "It seems that from very early there was a desire to go further by looking beyond the appearances for an internal connection between the two events which formed an oracle."[27] He comments later:

> In our eyes such "connections" do not exist. They are pure coincidences without importance. We have to believe (and we know it from other sources as well) that such was not the case with the ancient Mesopotamians, especially with their well-known

[26] Ibid., 11-12. This phenomenon will be of great importance in Chapter 3, in the discussion on the Medieval Mesopotamian preference for the works of Aristotle over those of the Platonists.

[27] Bottero, 132.

> doctrine of the world's government by the gods, and hence the preliminary fixing of the destinies, that is, the names, of all things by these gods.[28]

While we will discuss Bottero's identification between "name" and "destiny" in the next section, we may say here that there is *always*, for the Mesopotamian, a real reason for every event that occurs, whether this reason is known to human beings or not. Or, better, whether it is known to them *yet.* Oppenheim commenting on the practice of divination says, "Because of the belief that whatever happens within perception occurs not only due to specific if unknown causes, but also for the benefit of the observer to whom a supernatural agency is thereby revealing its intentions, the Akkadians of the Old Babylonian period began rather early to record such happenings."[29] In another work, Oppenheim translates what he calls a "Babylonian Diviner's Manual," which is just such a list of recordings of odd events ranging from "If bundles of reeds walk about in the countryside," to "If a wildcat opens its mouth and talks like a man."[30] A telling verse in this work is: "A sign that portends evil in the sky is (also) evil on earth; one that portends evil on earth is evil in the sky."[31]

We may conclude this section, then, by noting that this attitude toward the world requires a tremendous and profound *sensitivity* to surroundings. With this in place, and also with the *humility* of the human subject discussed above, the world becomes a wondrous and exciting place. To the sensitive Mesopotamian mind, then, *the physical world itself has real, true meaning*, and there is no need to posit another world, for example, the Platonic world of ideas, which gives meaning to this one. Moreover, the *wonder* or *curiosity* with which the Mesopotamian viewed the world expressed itself in a real, though realistic, desire to know as much as possible about the universe. This expressed itself, for example, in the long lists of the "divinatory manuals," which show

[28] Ibid., 133.

[29] Oppenheim, 210.

[30] A. Leo Oppenheim, "A Babylonian Diviner's Manual," in *Journal of Near Eastern Studies* 33.2 (1974): 203.

[31] Ibid., 204.

again the paradox of the greatness and the lowliness of the human race: though we wish to know everything, we can *only* know through a painstaking process of memory and sensory perception. Bottero concludes a section of his book: "[Divination] is a new characteristic that places next to the simple passive and detached knowledge of pure observation the desire to know *everything*: not only the observed reality but the possible; in other words the universal. This is a new characteristic that forces us to put forward the term Science."[32]

[32] Bottero, 36.

The Book of Genesis

Chapters 1-2

Revised Standard Version

Genesis, Chapter 1

[1] In the beginning God created the heavens and the earth.

[2] The earth was without form and void, and darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters.

[3] And God said, "Let there be light"; and there was light.

[4] And God saw that the light was good; and God separated the light from the darkness.

[5] God called the light Day, and the darkness he called Night. And there was evening and there was morning, one day.

[6] And God said, "Let there be a firmament in the midst of the waters, and let it separate the waters from the waters."

[7] And God made the firmament and separated the waters which were under the firmament from the waters which were above the firmament. And it was so.

[8] And God called the firmament Heaven. And there was evening and there was morning, a second day.

[9] And God said, "Let the waters under the heavens be gathered together into one place, and let the dry land appear." And it was so.

[10] God called the dry land Earth, and the waters that were gathered together he called Seas. And God saw that it was good.

[11] And God said, "Let the earth put forth vegetation, plants yielding seed, and fruit trees bearing fruit in which is their seed, each according to its kind, upon the earth." And it was so.

[12] The earth brought forth vegetation, plants yielding seed according to their own kinds, and trees bearing fruit in which is their seed, each according to its kind. And God saw that it was good.

[13] And there was evening and there was morning, a third day.

[14] And God said, "Let there be lights in the firmament of the heavens to separate the day from the night; and let them be for signs and for seasons and for days and years,

[15] and let them be lights in the firmament of the heavens to give light upon the earth." And it was so.
[16] And God made the two great lights, the greater light to rule the day, and the lesser light to rule the night; he made the stars also.
[17] And God set them in the firmament of the heavens to give light upon the earth,
[18] to rule over the day and over the night, and to separate the light from the darkness. And God saw that it was good.
[19] And there was evening and there was morning, a fourth day.
[20] And God said, "Let the waters bring forth swarms of living creatures, and let birds fly above the earth across the firmament of the heavens."
[21] So God created the great sea monsters and every living creature that moves, with which the waters swarm, according to their kinds, and every winged bird according to its kind. And God saw that it was good.
[22] And God blessed them, saying, "Be fruitful and multiply and fill the waters in the seas, and let birds multiply on the earth."
[23] And there was evening and there was morning, a fifth day.
[24] And God said, "Let the earth bring forth living creatures according to their kinds: cattle and creeping things and beasts of the earth according to their kinds." And it was so.
[25] And God made the beasts of the earth according to their kinds and the cattle according to their kinds, and everything that creeps upon the ground according to its kind. And God saw that it was good.
[26] Then God said, "Let us make man in our image, after our likeness; and let them have dominion over the fish of the sea, and over the birds of the air, and over the cattle, and over all the earth, and over every creeping thing that creeps upon the earth."
[27] So God created man in his own image, in the image of God he created him; male and female he created them.
[28] And God blessed them, and God said to them, "Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth."

[29] And God said, "Behold, I have given you every plant yielding seed which is upon the face of all the earth, and every tree with seed in its fruit; you shall have them for food.
[30] And to every beast of the earth, and to every bird of the air, and to everything that creeps on the earth, everything that has the breath of life, I have given every green plant for food." And it was so.
[31] And God saw everything that he had made, and behold, it was very good. And there was evening and there was morning, a sixth day.

Genesis, Chapter 2

[1] Thus the heavens and the earth were finished, and all the host of them.
[2] And on the seventh day God finished his work which he had done, and he rested on the seventh day from all his work which he had done.
[3] So God blessed the seventh day and hallowed it, because on it God rested from all his work which he had done in creation.
[4] These are the generations of the heavens and the earth when they were created.
In the day that the LORD God made the earth and the heavens,
[5] when no plant of the field was yet in the earth and no herb of the field had yet sprung up -- for the LORD God had not caused it to rain upon the earth, and there was no man to till the ground;
[6] but a mist went up from the earth and watered the whole face of the ground --
[7] then the LORD God formed man of dust from the ground, and breathed into his nostrils the breath of life; and man became a living being.
[8] And the LORD God planted a garden in Eden, in the east; and there he put the man whom he had formed.
[9] And out of the ground the LORD God made to grow every tree that is pleasant to the sight and good for food, the tree of life also in the midst of the garden, and the tree of the knowledge of good and evil.
[10] A river flowed out of Eden to water the garden, and there it divided and became four rivers.

[11] The name of the first is Pishon; it is the one which flows around the whole land of Havilah, where there is gold;
[12] and the gold of that land is good; bdellium and onyx stone are there.
[13] The name of the second river is Gihon; it is the one which flows around the whole land of Cush.
[14] And the name of the third river is Tigris, which flows east of Assyria. And the fourth river is the Euphrates.
[15] The LORD God took the man and put him in the garden of Eden to till it and keep it.
[16] And the LORD God commanded the man, saying, "You may freely eat of every tree of the garden;
[17] but of the tree of the knowledge of good and evil you shall not eat, for in the day that you eat of it you shall die."
[18] Then the LORD God said, "It is not good that the man should be alone; I will make him a helper fit for him."
[19] So out of the ground the LORD God formed every beast of the field and every bird of the air, and brought them to the man to see what he would call them; and whatever the man called every living creature, that was its name.
[20] The man gave names to all cattle, and to the birds of the air, and to every beast of the field; but for the man there was not found a helper fit for him.
[21] So the LORD God caused a deep sleep to fall upon the man, and while he slept took one of his ribs and closed up its place with flesh;
[22] and the rib which the LORD God had taken from the man he made into a woman and brought her to the man.
[23] Then the man said, "This at last is bone of my bones
and flesh of my flesh;
she shall be called Woman,
because she was taken out of Man."
[24] Therefore a man leaves his father and his mother and cleaves to his wife, and they become one flesh.
[25] And the man and his wife were both naked, and were not ashamed.

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On the Parts of Animals

Aristotle

Translated by William Ogle

Book I

Chapter 1

Every systematic science, the humblest and the noblest alike, seems to admit of two distinct kinds of proficiency; one of which may be properly called scientific knowledge of the subject, while the other is a kind of educational acquaintance with it. For an educated man should be able to form a fair off-hand judgement as to the goodness or badness of the method used by a professor in his exposition. To be educated is in fact to be able to do this; and even the man of universal education we deem to be such in virtue of his having this ability. It will, however, of course, be understood that we only ascribe universal education to one who in his own individual person is thus critical in all or nearly all branches of knowledge, and not to one who has a like ability merely in some special subject. For it is possible for a man to have this competence in some one branch of knowledge without having it in all.

It is plain then that, as in other sciences, so in that which inquires into nature, there must be certain canons, by reference to which a hearer shall be able to criticize the method of a professed exposition, quite independently of the question whether the statements made be true or false. Ought we, for instance (to give an illustration of what I mean), to begin by discussing each separate species-man, lion, ox, and the like-taking each kind in hand inde. pendently of the rest, or ought we rather to deal first with the attributes which they have in common in virtue of some common element of their nature, and proceed from this as a basis for the consideration of them separately? For genera that are quite distinct yet oftentimes present many identical phenomena, sleep, for instance, respiration, growth, decay, death, and other similar affections and conditions, which may be passed over for the present, as we are not yet prepared to treat of them with clearness and precision. Now it is plain that if we deal with each species independently of the rest, we shall frequently be obliged to repeat the same statements over and over again; for horse and dog and

man present, each and all, every one of the phenomena just enumerated. A discussion therefore of the attributes of each such species separately would necessarily involve frequent repetitions as to characters, themselves identical but recurring in animals specifically distinct. (Very possibly also there may be other characters which, though they present specific differences, yet come under one and the same category. For instance, flying, swimming, walking, creeping, are plainly specifically distinct, but yet are all forms of animal progression.) We must, then, have some clear understanding as to the manner in which our investigation is to be conducted; whether, I mean, we are first to deal with the common or generic characters, and afterwards to take into consideration special peculiarities; or whether we are to start straight off with the ultimate species. For as yet no definite rule has been laid down in this matter. So also there is a like uncertainty as to another point now to be mentioned. Ought the writer who deals with the works of nature to follow the plan adopted by the mathematicians in their astronomical demonstrations, and after considering the phenomena presented by animals, and their several parts, proceed subsequently to treat of the causes and the reason why; or ought he to follow some other method? And when these questions are answered, there yet remains another. The causes concerned in the generation of the works of nature are, as we see, more than one. There is the final cause and there is the motor cause. Now we must decide which of these two causes comes first, which second. Plainly, however, that cause is the first which we call the final one. For this is the Reason, and the Reason forms the starting-point, alike in the works of art and in works of nature. For consider how the physician or how the builder sets about his work. He starts by forming for himself a definite picture, in the one case perceptible to mind, in the other to sense, of his end-the physician of health, the builder of a house-and this he holds forward as the reason and explanation of each subsequent step that he takes, and of his acting in this or that way as the case may be. Now in the works of nature the good end and the final cause is still more dominant than in works of art such as these, nor is necessity a factor with the same significance in them all; though almost all writers, while they try to refer their origin to this cause,

do so without distinguishing the various senses in which the term necessity is used. For there is absolute necessity, manifested in eternal phenomena; and there is hypothetical necessity, manifested in everything that is generated by nature as in everything that is produced by art, be it a house or what it may. For if a house or other such final object is to be realized, it is necessary that such and such material shall exist; and it is necessary that first this then that shall be produced, and first this and then that set in motion, and so on in continuous succession, until the end and final result is reached, for the sake of which each prior thing is produced and exists. As with these productions of art, so also is it with the productions of nature. The mode of necessity, however, and the mode of ratiocination are different in natural science from what they are in the theoretical sciences; of which we have spoken elsewhere. For in the latter the starting-point is that which is; in the former that which is to be. For it is that which is yet to be-health, let us say, or a man-that, owing to its being of such and such characters, necessitates the pre-existence or previous production of this and that antecedent; and not this or that antecedent which, because it exists or has been generated, makes it necessary that health or a man is in, or shall come into, existence. Nor is it possible to track back the series of necessary antecedents to a starting-point, of which you can say that, existing itself from eternity, it has determined their existence as its consequent. These however again, are matters that have been dealt with in another treatise. There too it was stated in what cases absolute and hypothetical necessity exist; in what cases also the proposition expressing hypothetical necessity is simply convertible, and what cause it is that determines this convertibility.

Another matter which must not be passed over without consideration is, whether the proper subject of our exposition is that with which the ancient writers concerned themselves, namely, what is the process of formation of each animal; or whether it is not rather, what are the characters of a given creature when formed. For there is no small difference between these two views. The best course appears to be that we should follow the method already mentioned, and begin with the phenomena presented by

each group of animals, and, when this is done, proceed afterwards to state the causes of those phenomena, and to deal with their evolution. For elsewhere, as for instance in house building, this is the true sequence. The plan of the house, or the house, has this and that form; and because it has this and that form, therefore is its construction carried out in this or that manner. For the process of evolution is for the sake of the thing finally evolved, and not this for the sake of the process. Empedocles, then, was in error when he said that many of the characters presented by animals were merely the results of incidental occurrences during their development; for instance, that the backbone was divided as it is into vertebrae, because it happened to be broken owing to the contorted position of the foetus in the womb. In so saying he overlooked the fact that propagation implies a creative seed endowed with certain formative properties. Secondly, he neglected another fact, namely, that the parent animal pre-exists, not only in idea, but actually in time. For man is generated from man; and thus it is the possession of certain characters by the parent that determines the development of like characters in the child. The same statement holds good also for the operations of art, and even for those which are apparently spontaneous. For the same result as is produced by art may occur spontaneously. Spontaneity, for instance, may bring about the restoration of health. The products of art, however, require the pre-existence of an efficient cause homogeneous with themselves, such as the statuary's art, which must necessarily precede the statue; for this cannot possibly be produced spontaneously. Art indeed consists in the conception of the result to be produced before its realization in the material. As with spontaneity, so with chance; for this also produces the same result as art, and by the same process.

The fittest mode, then, of treatment is to say, a man has such and such parts, because the conception of a man includes their presence, and because they are necessary conditions of his existence, or, if we cannot quite say this, which would be best of all, then the next thing to it, namely, that it is either quite impossible for him to exist without them, or, at any rate, that it is better for him that they should be there; and their existence

involves the existence of other antecedents. Thus we should say, because man is an animal with such and such characters, therefore is the process of his development necessarily such as it is; and therefore is it accomplished in such and such an order, this part being formed first, that next, and so on in succession; and after a like fashion should we explain the evolution of all other works of nature.

Now that with which the ancient writers, who first philosophized about Nature, busied themselves, was the material principle and the material cause. They inquired what this is, and what its character; how the universe is generated out of it, and by what motor influence, whether, for instance, by antagonism or friendship, whether by intelligence or spontaneous action, the substratum of matter being assumed to have certain inseparable properties; fire, for instance, to have a hot nature, earth a cold one; the former to be light, the latter heavy. For even the genesis of the universe is thus explained by them. After a like fashion do they deal also with the development of plants and of animals. They say, for instance, that the water contained in the body causes by its currents the formation of the stomach and the other receptacles of food or of excretion; and that the breath by its passage breaks open the outlets of the nostrils; air and water being the materials of which bodies are made; for all represent nature as composed of such or similar substances.

But if men and animals and their several parts are natural phenomena, then the natural philosopher must take into consideration not merely the ultimate substances of which they are made, but also flesh, bone, blood, and all other homogeneous parts; not only these, but also the heterogeneous parts, such as face, hand, foot; and must examine how each of these comes to be what it is, and in virtue of what force. For to say what are the ultimate substances out of which an animal is formed, to state, for instance, that it is made of fire or earth, is no more sufficient than would be a similar account in the case of a couch or the like. For we should not be content with saying that the couch was made of bronze or wood or whatever it might be, but should try to describe

its design or mode of composition in preference to the material; or, if we did deal with the material, it would at any rate be with the concretion of material and form. For a couch is such and such a form embodied in this or that matter, or such and such a matter with this or that form; so that its shape and structure must be included in our description. For the formal nature is of greater importance than the material nature.

Does, then, configuration and colour constitute the essence of the various animals and of their several parts? For if so, what Democritus says will be strictly correct. For such appears to have been his notion. At any rate he says that it is evident to every one what form it is that makes the man, seeing that he is recognizable by his shape and colour. And yet a dead body has exactly the same configuration as a living one; but for all that is not a man. So also no hand of bronze or wood or constituted in any but the appropriate way can possibly be a hand in more than name. For like a physician in a painting, or like a flute in a sculpture, in spite of its name it will be unable to do the office which that name implies. Precisely in the same way no part of a dead body, such I mean as its eye or its hand, is really an eye or a hand. To say, then, that shape and colour constitute the animal is an inadequate statement, and is much the same as if a woodcarver were to insist that the hand he had cut out was really a hand. Yet the physiologists, when they give an account of the development and causes of the animal form, speak very much like such a craftsman. What, however, I would ask, are the forces by which the hand or the body was fashioned into its shape? The woodcarver will perhaps say, by the axe or the auger; the physiologist, by air and by earth. Of these two answers the artificer's is the better, but it is nevertheless insufficient. For it is not enough for him to say that by the stroke of his tool this part was formed into a concavity, that into a flat surface; but he must state the reasons why he struck his blow in such a way as to effect this, and what his final object was; namely, that the piece of wood should develop eventually into this or that shape. It is plain, then, that the teaching of the old physiologists is inadequate, and that the true method is to state what the definitive characters are that distinguish the animal as a whole; to

explain what it is both in substance and in form, and to deal after the same fashion with its several organs; in fact, to proceed in exactly the same way as we should do, were we giving a complete description of a couch.

If now this something that constitutes the form of the living being be the soul, or part of the soul, or something that without the soul cannot exist; as would seem to be the case, seeing at any rate that when the soul departs, what is left is no longer a living animal, and that none of the parts remain what they were before, excepting in mere configuration, like the animals that in the fable are turned into stone; if, I say, this be so, then it will come within the province of the natural philosopher to inform himself concerning the soul, and to treat of it, either in its entirety, or, at any rate, of that part of it which constitutes the essential character of an animal; and it will be his duty to say what this soul or this part of a soul is; and to discuss the attributes that attach to this essential character, especially as nature is spoken of in two senses, and the nature of a thing is either its matter or its essence; nature as essence including both the motor cause and the final cause. Now it is in the latter of these two senses that either the whole soul or some part of it constitutes the nature of an animal; and inasmuch as it is the presence of the soul that enables matter to constitute the animal nature, much more than it is the presence of matter which so enables the soul, the inquirer into nature is bound on every ground to treat of the soul rather than of the matter. For though the wood of which they are made constitutes the couch and the tripod, it only does so because it is capable of receiving such and such a form.

What has been said suggests the question, whether it is the whole soul or only some part of it, the consideration of which comes within the province of natural science. Now if it be of the whole soul that this should treat, then there is no place for any other philosophy beside it. For as it belongs in all cases to one and the same science to deal with correlated subjects-one and the same science, for instance, deals with sensation and with the objects of sense-and as therefore the intelligent soul and the objects of

intellect, being correlated, must belong to one and the same science, it follows that natural science will have to include the whole universe in its province. But perhaps it is not the whole soul, nor all its parts collectively, that constitutes the source of motion; but there may be one part, identical with that in plants, which is the source of growth, another, namely the sensory part, which is the source of change of quality, while still another, and this not the intellectual part, is the source of locomotion. I say not the intellectual part; for other animals than man have the power of locomotion, but in none but him is there intellect. Thus then it is plain that it is not of the whole soul that we have to treat. For it is not the whole soul that constitutes the animal nature, but only some part or parts of it. Moreover, it is impossible that any abstraction can form a subject of natural science, seeing that everything that Nature makes is means to an end. For just as human creations are the products of art, so living objects are manifest in the products of an analogous cause or principle, not external but internal, derived like the hot and the cold from the environing universe. And that the heaven, if it had an origin, was evolved and is maintained by such a cause, there is therefore even more reason to believe, than that mortal animals so originated. For order and definiteness are much more plainly manifest in the celestial bodies than in our own frame; while change and chance are characteristic of the perishable things of earth. Yet there are some who, while they allow that every animal exists and was generated by nature, nevertheless hold that the heaven was constructed to be what it is by chance and spontaneity; the heaven, in which not the faintest sign of haphazard or of disorder is discernible! Again, whenever there is plainly some final end, to which a motion tends should nothing stand in the way, we always say that such final end is the aim or purpose of the motion; and from this it is evident that there must be a something or other really existing, corresponding to what we call by the name of Nature. For a given germ does not give rise to any chance living being, nor spring from any chance one; but each germ springs from a definite parent and gives rise to a definite progeny. And thus it is the germ that is the ruling influence and fabricator of the offspring. For these it is by nature, the offspring being at any rate that which

in nature will spring from it. At the same time the offspring is anterior to the germ; for germ and perfected progeny are related as the developmental process and the result. Anterior, however, to both germ and product is the organism from which the germ was derived. For every germ implies two organisms, the parent and the progeny. For germ or seed is both the seed of the organism from which it came, of the horse, for instance, from which it was derived, and the seed of the organism that will eventually arise from it, of the mule, for example, which is developed from the seed of the horse. The same seed then is the seed both of the horse and of the mule, though in different ways as here set forth. Moreover, the seed is potentially that which will spring from it, and the relation of potentiality to actuality we know.

There are then two causes, namely, necessity and the final end. For many things are produced, simply as the results of necessity. It may, however, be asked, of what mode of necessity are we speaking when we say this. For it can be of neither of those two modes which are set forth in the philosophical treatises. There is, however, the third mode, in such things at any rate as are generated. For instance, we say that food is necessary; because an animal cannot possibly do without it. This third mode is what may be called hypothetical necessity. Here is another example of it. If a piece of wood is to be split with an axe, the axe must of necessity be hard; and, if hard, must of necessity be made of bronze or iron. Now exactly in the same way the body, which like the axe is an instrument-for both the body as a whole and its several parts individually have definite operations for which they are made-just in the same way, I say, the body, if it is to do its work, must of necessity be of such and such a character, and made of such and such materials.

It is plain then that there are two modes of causation, and that both of these must, so far as possible, be taken into account in explaining the works of nature, or that at any rate an attempt must be made to include them both; and that those who fail in this tell us in reality nothing about nature. For primary cause constitutes the nature of an animal much more than does its matter. There are

indeed passages in which even Empedocles hits upon this, and following the guidance of fact, finds himself constrained to speak of the ratio (olugos) as constituting the essence and real nature of things. Such, for instance, is the case when he explains what is a bone. For he does not merely describe its material, and say it is this one element, or those two or three elements, or a compound of all the elements, but states the ratio (olugos) of their combination. As with a bone, so manifestly is it with the flesh and all other similar parts.

The reason why our predecessors failed in hitting upon this method of treatment was, that they were not in possession of the notion of essence, nor of any definition of substance. The first who came near it was Democritus, and he was far from adopting it as a necessary method in natural science, but was merely brought to it, spite of himself, by constraint of facts. In the time of Socrates a nearer approach was made to the method. But at this period men gave up inquiring into the works of nature, and philosophers diverted their attention to political science and to the virtues which benefit mankind.

Of the method itself the following is an example. In dealing with respiration we must show that it takes place for such or such a final object; and we must also show that this and that part of the process is necessitated by this and that other stage of it. By necessity we shall sometimes mean hypothetical necessity, the necessity, that is, that the requisite antecedants shall be there, if the final end is to be reached; and sometimes absolute necessity, such necessity as that which connects substances and their inherent properties and characters. For the alternate discharge and re-entrance of heat and the inflow of air are necessary if we are to live. Here we have at once a necessity in the former of the two senses. But the alternation of heat and refrigeration produces of necessity an alternate admission and discharge of the outer air, and this is a necessity of the second kind.

In the foregoing we have an example of the method which we must adopt, and also an example of the kind of phenomena, the causes of which we have to investigate.

Chapter 5

Of things constituted by nature some are ungenerated, imperishable, and eternal, while others are subject to generation and decay. The former are excellent beyond compare and divine, but less accessible to knowledge. The evidence that might throw light on them, and on the problems which we long to solve respecting them, is furnished but scantily by sensation; whereas respecting perishable plants and animals we have abundant information, living as we do in their midst, and ample data may be collected concerning all their various kinds, if only we are willing to take sufficient pains. Both departments, however, have their special charm. The scanty conceptions to which we can attain of celestial things give us, from their excellence, more pleasure than all our knowledge of the world in which we live; just as a half glimpse of persons that we love is more delightful than a leisurely view of other things, whatever their number and dimensions. On the other hand, in certitude and in completeness our knowledge of terrestrial things has the advantage. Moreover, their greater nearness and affinity to us balances somewhat the loftier interest of the heavenly things that are the objects of the higher philosophy. Having already treated of the celestial world, as far as our conjectures could reach, we proceed to treat of animals, without omitting, to the best of our ability, any member of the kingdom, however ignoble. For if some have no graces to charm the sense, yet even these, by disclosing to intellectual perception the artistic spirit that designed them, give immense pleasure to all who can trace links of causation, and are inclined to philosophy. Indeed, it would be strange if mimic representations of them were attractive, because they disclose the mimetic skill of the painter or sculptor, and the original realities themselves were not more interesting, to all at any rate who have eyes to discern the reasons that determined their formation. We therefore must not recoil with childish aversion from the examination of the humbler animals. Every realm of nature is marvellous: and as Heraclitus,

when the strangers who came to visit him found him warming himself at the furnace in the kitchen and hesitated to go in, reported to have bidden them not to be afraid to enter, as even in that kitchen divinities were present, so we should venture on the study of every kind of animal without distaste; for each and all will reveal to us something natural and something beautiful. Absence of haphazard and conduciveness of everything to an end are to be found in Nature's works in the highest degree, and the resultant end of her generations and combinations is a form of the beautiful.

If any person thinks the examination of the rest of the animal kingdom an unworthy task, he must hold in like disesteem the study of man. For no one can look at the primordia of the human frame-blood, flesh, bones, vessels, and the like-without much repugnance. Moreover, when any one of the parts or structures, be it which it may, is under discussion, it must not be supposed that it is its material composition to which attention is being directed or which is the object of the discussion, but the relation of such part to the total form. Similarly, the true object of architecture is not bricks, mortar, or timber, but the house; and so the principal object of natural philosophy is not the material elements, but their composition, and the totality of the form, independently of which they have no existence.

The course of exposition must be first to state the attributes common to whole groups of animals, and then to attempt to give their explanation. Many groups, as already noticed, present common attributes, that is to say, in some cases absolutely identical affections, and absolutely identical organs,-feet, feathers, scales, and the like-while in other groups the affections and organs are only so far identical as that they are analogous. For instance, some groups have lungs, others have no lung, but an organ analogous to a lung in its place; some have blood, others have no blood, but a fluid analogous to blood, and with the same office. To treat of the common attributes in connexion with each individual group would involve, as already suggested, useless iteration. For many groups have common attributes. So much for this topic.

As every instrument and every bodily member subserves some partial end, that is to say, some special action, so the whole body must be destined to minister to some Plenary sphere of action. Thus the saw is made for sawing, for sawing is a function, and not sawing for the saw. Similarly, the body too must somehow or other be made for the soul, and each part of it for some subordinate function, to which it is adapted.

We have, then, first to describe the common functions, common, that is, to the whole animal kingdom, or to certain large groups, or to the members of a species. In other words, we have to describe the attributes common to all animals, or to assemblages, like the class of Birds, of closely allied groups differentiated by gradation, or to groups like Man not differentiated into subordinate groups. In the first case the common attributes may be called analogous, in the second generic, in the third specific.

When a function is ancillary to another, a like relation manifestly obtains between the organs which discharge these functions; and similarly, if one function is prior to and the end of another, their respective organs will stand to each other in the same relation. Thirdly, the existence of these parts involves that of other things as their necessary consequents.

Instances of what I mean by functions and affections are Reproduction, Growth, Copulation, Waking, Sleep, Locomotion, and other similar vital actions. Instances of what I mean by parts are Nose, Eye, Face, and other so-called members or limbs, and also the more elementary parts of which these are made. So much for the method to be pursued. Let us now try to set forth the causes of all vital phenomena, whether universal or particular, and in so doing let us follow that order of exposition which conforms, as we have indicated, to the order of nature.

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The Principles of Nature

St. Thomas Aquinas

Translated by Gerard T. Campbell

Notice carefully that some thing can be although it is not, whereas another thing truly is. That which can be is called being in potency; that which already is, is called being in act. But there are two kinds of being: namely essential being or the substantial being of the thing (as, for example, to be a man) and this is to be absolutely. The other kind of being is accidental being (as, for example, to be a white man), and this is to be after-a-fashion or in some qualified way.

To each of these kinds of being (i.e. substantial being and accidental being) there is something which is in potency. For there is something which is in potency to be a man, namely, the sperm and the menstrual blood; and there is also something which is in potency to being white, namely, a man. And that which is in potency to substantial being just as much as that which is in potency to accidental being can be called matter; as, for example, the sperm is with respect to the man and the man, in respect to whiteness. But there is a difference. The matter which is in potency to substantial being is called the matter 'out of which' whereas the matter which is in potency to accidental being is called the matter 'in which'. Again, in a strict way of speaking, that which is in potency to substantial being is called prime matter, however, that which is in potency to accidental being is called the subject: This is why it is said that accidents are in a subject--and also why it is not said that substantial form is in a subject. And it is according to this notion that 'matter' differs from 'subject' because the subject does not have its being from what comes to it but has in itself complete being (as, for example, a man does not derive his being from his whiteness). But matter, on the other hand, does derive its being from what comes to it, since, of itself, it has incomplete being. Therefore, strictly speaking, (substantial) form gives being to matter, whereas accidents do not give being to a subject, but rather, the subject to the accidents. Sometimes, however (in popular terminology), one term is used for the other, that is, 'matter' for 'subject' and vice-versa.

Again, just as everything which is in potency can be called 'matter' in the same way everything by which something has being (either substantially or accidentally), can be called 'form'; for example, in man since he is potentially white, he becomes actually white through whiteness, and the sperm, since it is potentially man becomes actually man through the soul. And because it is the form which makes something to be in act, accordingly the form is called 'act'. Moreover, that which brings about substantial being in act is called 'substantial form', and that which brings about accidental being in act is called 'accidental form'.

Now since generation (coming-to-be) is a movement towards form, there are two kinds of generation which correspond to these two kinds of forms: absolute coming-to-be corresponds to substantial form-relative coming-to-be (coming-to-be-in-a-certain-way), corresponds to accidental form. For whenever substantial form is introduced, we say that something absolutely becomes (i.e. without qualification)--for example, a man becomes a man or a man comes-to-be. However, when accidental form is introduced, we do not say that something becomes absolutely--but rather that it becomes this--for example, when a man becomes white we do not say that he becomes a man or that a man has come-to-be but rather that the man becomes white or comes-to-be white. And there is a two-fold notion of corruption (passing away) which is opposed to this two-fold notion of generation (coming-to-be)--namely, absolute passing-away and relative passing away. Absolute generation (coming-to-be) and absolute corruption (passing away) exist only within the genus of substance. On the other hand relative generation and relative corruption (coming-to-be-and passing-away-in some way or other) are found in all of the other genera. And because generation is a kind of movement from non-being to being and, conversely, corruption from being to non-being, it is not from just any kind of non-being that generation comes but from non-being which is being in potency--just as, for example, the statue comes from bronze which is statue in potency, not in act.

And, therefore, in order that generation (coming-to-be) come about, three things are necessary: namely, a potential something which is the matter, and not-being in act which is the

privation, and that through which it becomes in act, namely, the form. Let us take an example: when a statue-is made from bronze, the bronze which is in potency for the form of the statue is 'the matter'; the privation is the shapelessness or the lack of the form (of statue in the molten bronze); the shape by which we call it a statue is the form. The form of statue, however, is not the substantial form, because the bronze before the coming-to-be of this form (of statue) has being in act, and its being does not depend upon this shape (of statue) which is an accidental form. All artificial forms are accidental forms. For art only operates upon those things already constituted in being by nature.

There are, therefore, three principles of nature, and these are matter, form, and privation. One of these principles, namely, the form, is that towards which coming-to-be moves: the other two are on the side of that from which coming-to-be arises. Hence matter and privation are in the same subject but seen from different viewpoints. For it is the same subject which is both bronze and unshaped (with respect to the statue) before the advent of the form--but it is for one reason that we call it bronze and for another reason that we call it unshaped. Hence privation is called a principle, not essentially but accidentally, because it coincides with the matter; for example, we say that a doctor builds something accidentally, for the doctor builds something not in so far as he is a doctor, but in so far as he is a builder and builder coincides with doctor in one subject. Now accidents are of two kinds. There are necessary accidents which are not separated from the thing, as, for example, risibility from man; and there are non-necessary accidents which are separated, such as whiteness from man. So although privation is an accidental principle, it does not follow that it is not necessary for coming-to-be. For matter is never without privation: for in so far as the matter is under one form it has the privation of another form and viceversa. For example, in fire there is the privation of air and in air the privation of fire.

It should be noticed that although coming-to-be arises from not-being, we do not say that negation is its principle, but rather, privation; and this is because negation does not determine the subject for itself. Not-seeing can be said even of non-beings as, for example, "Chimeras do not see." Likewise it can be said of

beings which are not intended by nature to have sight, such as a stone. But privation is said only of a determinate subject which is intended by nature to have a given state: thus blindness, for example, is only said of those things which are intended by nature to see. And because coming-to-be does not arise from absolute non-being but from non-being which is in a certain subject, and not in just any subject but in a determined one, (for it is not from just any non-burning thing that fire comes about, but from a non-burning thing which by nature can become the form of fire)--it is because of this that privation is a principle. But in this, privation as a principle differs from the other principles because the others are principles both in being and becoming. For that this should become a statue it is necessary that there be bronze and, ultimately, the shape of the statue: and, moreover, once it is a statue, it is again necessary that both of these exist. But privation is a principle in becoming and not in being, for while the statue is becoming it cannot be a statue. If it were a statue, it could not be becoming one, because what is becoming is only in successive stages, as are time and motion. But from that which already is a statue, there is not the privation of statue in it. Because affirmation and negation cannot exist simultaneously, similarly neither can the state and the privation of that state. And so privation is an accidental principle in the sense explained above; the other two are essential principles.

From what has already been said, it is evident that matter differs from form and from privation according to definition. For matter is that in which both form and privation are understood, just as both a shape and a lack of a shape are understood in the bronze. And sometimes the way in which we name the matter involves the notion of privation and sometimes it does not involve the notion of privation; for example, bronze, although it is the matter of the statue does not involve the notion of privation because when I say "bronze", the lack of a form or the lack of a shape is not included in my concept. On the other hand, flour, since it is the matter with respect to bread does involve in itself the privation of the form of bread, because when I say "flour" the lack of form or the disorganization opposed to the form of bread is signified. And because in coming-to-be the matter or the subject remains, but the privation does not, and neither does the

composite of matter and privation, accordingly, matter which does not involve the notion of privation remains; however, that matter which does involve the notion of privation, is transitory.

It should also be noted that some matter has a composition of form; for example, although the bronze is the matter with respect to the statue, nevertheless, the bronze itself is a composite of matter and form. Therefore, bronze cannot be called prime matter because it has a matter. Only that matter which can be understood without any form and privation, but which is the subject of both form and privation, is called prime matter because there is not any other matter prior to it. And this prime matter is also called "hyle".

Because all knowledge and every definition is through the form, therefore, prime matter cannot be known or defined by itself, but by the composite: and so we say that prime matter is that which is related to all forms and all privations like the bronze is related to the statue and to the privation of some figure. And prime matter here means prime in an absolute way. For something can also be called primary with respect to a certain genus, such as water being the prime matter in the genus of liquids. Nevertheless, water is not prime in an absolute way, because it is a composite of matter and form; hence it has a matter prior to it.

Again it should be noted that both prime matter and form neither come-to-be nor pass-away because all coming-to-be is from something to something. Now that from which the coming-to-be is from is the matter; and that to which the coming-to-be is to is the form. Therefore, if the matter or the form also come-to-be, there would be a matter of the matter and a form of the form ad infinitum. Hence, strictly speaking, only the composite comes-to-be.

Again it should be noted that prime matter is said to be numerically one in all things. But "numerically one" can be said in two ways: first of all, of that which has a one determined form in number as, for example, Socrates. Now prime matter is not said to be numerically one in this way since, in itself, it does not have any one form. Secondly, something can also be said to be numerically one which is without the dispositions which would make it differ according to number. And it is in this way that prime matter is said

to be numerically one, because its concept involves the lack of all of the dispositions which account for differentiation in number.

And finally it should be noted that although the concept of prime matter does not include any form or privation, just as in the concept of bronze there is included neither a shape nor the lack of a shape, nevertheless prime matter is never without some form and privation. For sometimes it is under one form and sometimes under another form. But prime matter cannot exist by itself alone, because by its very definition it does not have any form, and so does not have any actual existence, sincebeing in act is only through the form. But prime matter is only in potency. And, therefore, anything whatsoever that exists in act cannot be called prime matter.

From what has been said it is evident that there are three principles of nature, namely, matter, form, and privation. But these three are not sufficient to explain coming-to-be. For whatever is in potency cannot reduce itself to act: for example, the bronze which is a statue in potency does not make itself a statue, but requires an agent which draws out from potency to act the form of the statue. Neither can the form draw itself into act from potency. And here I am speaking of the form generated which we call the term of generation. For the form does not exist unless it exists in fact: the agent, however, exists in becoming, that is, while the thing is coming-to-be. Besides the matter and the form, therefore, there must exist some other principle which acts, and this is called the efficient cause or, the moving cause, or the agent, or the principle from whence the movement exists.

And because, as Aristotle points out in Bk. II of the Metaphysics, everything which acts, acts only when intending something, a fourth principle must also be posited--namely, that which is intended by the agent, and this is called the end. And it should be noted that although every agent whether natural or voluntary intends an end, nevertheless it does not follow that every agent knows the end or deliberates about the end. For to know the end is necessary only in those things whose actions are not determined but which can move towards opposites, as is the case with voluntary agents; for these (voluntary agents) it is necessary that they know the end through which they determine

their actions. In natural agents, however, their actions are determined, hence it is not necessary to choose those things (means) which are for the end. We may use the example given by Avicenna of the cithara (a musical instrument resembling a lyre) player who does not have to deliberate about each note of a chord since the notes are determined within it, for should someone deliberate, there would be a delay between the notes which would be discordant. All of this can be seen more clearly with respect to voluntary agents who deliberate than with natural agents--and, accordingly, it is evident a fortiori that if the voluntary agent whose deliberation is more evident, does not always deliberate, then certainly neither does the natural agent. It is therefore possible for a natural agent to intend an end without deliberation and this intending is nothing other than having a natural inclination towards something.

From what has been said it is evident that there are four causes, namely, the material, the efficient, the formal, and the final. Now although principle and cause are spoken of in a quasi-convertible way, as is said in Bk. V of the Metaphysics, nevertheless, in the Physics, Aristotle sets down four causes and three principles. Furthermore, he accepts as causes just as much extrinsic as intrinsic ones. Matter and form are called intrinsic causes of the thing due to the fact that they are the constitutive parts of the thing. The efficient and the final causes are called extrinsic causes because they are outside of the thing. But he accepts only the intrinsic causes as principles. Moreover, privation is not named among the causes because it is an accidental principle, as was said earlier. And when we speak of the four causes, we mean the essential causes to which, however, accidental causes are reduced because everything which is accidental is reduced to that which is essential.

But although Aristotle considers principles as intrinsic causes in Bk. I of the Physics, nevertheless, as he says in Bk. XI of the Metaphysics (this is today Bk. XII, 11 70b22-30), "principle" is properly said of extrinsic causes and "elements" of those causes which are the parts of the thing, that is, of the instrinsic causes. However "cause" is used with respect to both, although sometimes one term is used for the other; for every cause can be called a

principle and every principle, a cause. But, the notion of cause seems to add something over and above what is commonly called principle, because that which is first, whether or not something posterior follows from it, can be called a principle, just as the artisan is called the principle of the knife because a knife comes into being as a result of his activity: but when something is moved from blackness to whiteness, blackness is called the principle of that movement (and universally, everything from which a movement begins is called a principle), nevertheless, blackness is not that from which the being of whiteness follows. But "cause" is said only of that thing which is first from which a posterior thing follows in being (that is, with real dependence). Hence, a cause is that from the being of which another being follows. Accordingly, that which is first from which the movement begins cannot be called a cause essentially (per se) even if it is called a principle. This is the reason privation is placed among the principles but not among the causes, because privation is that from which the coming-to-be begins. But privation can also be called a cause per accidens, in so far as it coincides with the matter, as was explained earlier.

Moreover, the term "element" is used properly only of the causes from which the composition of the thing results--which, properly speaking, are material causes. And again, not from just any material cause whatsoever but from that from which results the primary composition of the thing; for example, we do not say that the limbs are the elements of the man because the limbs are themselves composed of other things. But we do call earth and water elements because these are not composed of other bodies--but from these elements results the primary composition of natural bodies. Thus Aristotle in Bk. V of the Metaphysics says that "an element is that from which a thing is primarily composed, and is in the thing, and is not divided according to the form". The explanation of the first part of this definition namely, "that from which a thing is primarily composed", is already clear from what has been said above. The second part, namely, "and is in the thing", is placed in the definition in order to differentiate (the element from) that other matter (prime matter) which totally passes-away through coming-to-be: for example, the bread is the matter of

blood, but blood only comes-to-be if the bread passes-away; hence the bread does not remain in the blood and so the bread cannot be called an element of blood. But for it to be an element it must remain in some way, since it does not entirely pass-away, as is said in the treatise On Generation. The third part of the definition, namely, "and is not divided according to the form" is placed in the definition to differentiate the element from those things which have diverse parts in form, that is, in species; for example, the hand, whose parts are flesh and bone, but which differ according to species; for example, any part whatsoever of water is water. It is not necessary to the being of the element to be not divided according to quantity, it is sufficient if it be not divided according to species. If something is also not divided in any way, it is called an element, as letters are said to be the elements of words. Accordingly, it is evident from what has been said that "principle" in some way in which it is used implies more than "cause", and "cause", more than "element"--and this is what the Commentator (Averroes) says in his commentary on Bk. V of the Metaphysics.

Having seen that there are four genera of causes, it should be noted that it is not impossible for a same thing to have several causes, such as the statue whose cause is bronze and the artisan, but the artisan as the efficient cause, bronze as the material cause. Nor is it impossible that a same thing be the cause of contraries, just as the helmsman is the cause of the safety of the ship and of its sinking; but of the latter by his absence, and of the former by his presence.

It should also be noted that it is possible that a same thing be cause and caused with respect to the same thing but in different ways: for example, walking is the cause of health in the way of efficient causality, but health is the cause of walking in the way of final causality, for sometimes walking is done for the sake of health. Another example is that the body is the matter of the soul, while the soul is the form of the body. The efficient cause is called a cause with respect to the end, for the end can only exist in act through the operation of the agent: but the end is called the cause of the efficient cause, for the efficient cause operates only through the intention of the end. Hence the efficient cause is cause of that which is the end, as, for example, walking for the sake of health;

nevertheless the efficient cause does not make the end, that is, it does not make the end to be a final cause. A doctor, for example, makes health to be in act, nevertheless, he does not make health be an end. The end, however, is not the cause of that which is the efficient cause, but it is the cause that an efficient cause be an efficient cause. For health does not make the doctor to be a doctor (and I am speaking of the health resulting from the operation of the doctor) but it does make the doctor be an efficient cause. Similarly the end makes the matter be the material cause and the form be the formal cause, since the matter receives the form only for an end, and the form perfects the matter only for and end. Hence the end is called the cause of causes because it is the cause of the causality in all causes. Also matter is called the cause of the form in so far as the form exists only in matter; and similarly the form is the cause of the matter, in so far as matter has being in act only through the form. For matter and form are said to be mutually related as is said in Bk. II of the Physics. For they are said in relation to the composite, as are parts in relation to the whole, and the simple in relation to the composite.

But because every cause, in so far as it is a cause, is naturally prior to what is caused, it should be noted that "prior" is said in two ways, as Aristotle says in Bk. XVI of On Animals (c.f. On the Generation of Animals II, 6, 742a21). Through this diversity, something can be called both prior and posterior and cause and caused with respect to the same thing. For something is called prior to another in generation and time or prior in substance and completeness. Therefore, since the operation of nature is from the imperfect to the perfect and from the incomplete to the complete, the imperfect is prior to the perfect according to generation and time, but the perfect is prior to the imperfect according to substance: for example, it can be said that the man is prior to the boy in substance and completeness, but the boy is prior to the man in generation and time. But, although in things capable of coming-to-be, the imperfect is prior to the perfect and potency is prior to act--considering that in any subject that what is prior is imperfect rather than perfect and in potency rather than in act--nevertheless, absolutely speaking, it is necessary that what is in act and perfect be prior; because what reduces potency to act is in act and what

perfects the imperfect is perfect. The matter is prior to the form in generation and time, for that to which something comes is prior to that which comes to it. But the form is prior to the matter in substance and complete being because the matter has complete being only through the form. Similarly the efficient cause is prior to the end in generation and time, since the movement towards the end is brought about by the efficient cause; but the end is prior to the efficient cause, in so far as it is efficient cause, in substance and completeness, since the action of the efficient cause brings about completeness only through the end. Accordingly, these two causes, the material and the efficient are prior by way of generation; but the form and the end are prior by way of perfection.

And it should be noted that there are two kinds of necessity, namely, absolute necessity and conditional necessity. That necessity is absolute which proceeds from prior causes in the order of generation, and these are the material and the efficient causes; for example the necessity of death which comes about from matter, namely from the disposition of contrary components--and it is called absolute because there is no impediment to it. This necessity is also called the necessity of matter. On the other hand, conditional necessity proceeds from causes which are posterior in generation, namely, from the form and the end; for example, we say that it is necessary that there be conception if a man is to be generated. And this necessity is also called conditional, because it is not absolutely necessary that this woman conceive but only under this condition, namely, if a man is to be generated. And this necessity is called the necessity of the end.

And it should be noted that three of the causes, namely, the form, the end and the efficient cause, can coincide in one thing as is evident in the coming-to-be of fire. For fire brings fire to be, therefore fire is the efficient cause in so far as it brings to be; and again, fire is the form in so far as it makes to be in act what before was in potency; and again it is the end in so far as it is the intention of the agent and in so far as the operation of the agent is terminated in it. But there are two kinds of ends, namely, the end of the generation and the end of the thing generated, such as is evident in the generation of a knife: for the form of a knife is the end of the generation, but cutting, which is the operation of the

knife, is the end of the thing generated, that is, the knife. However, sometimes the end of the generation coincides with the other two above-mentioned causes (the form and the efficient cause), namely, when the generation is of what is similar in species; for example, when a man generates a man or an olive tree generates an olive tree which (coincidence of form, efficient cause, and end) cannot be understood of the end of the thing generated. Nevertheless it should be noted that the end is identical with the form numerically, because it is the same something numerically which is the form generated and is the end of generation. But the end of the generation is not identical with the efficient cause in the same number but in the same species. For it is impossible that the maker and the thing made be numerically the same, but they can be specifically the same; for example, when a man generates a man, the man generating and the man generated are different by number but of the same species. However, the matter cannot coincide with the other causes because the matter by the fact that it is a being in potency, has the notion of imperfection; but the other causes, since they are in act, involve the notion of perfection; moreover, the perfect and the imperfect do not coincide in the same thing.

Accordingly, having seen that there are four causes, namely, the efficient, the material, the formal, and the final it should be known that these same causes are divided in many ways. There can be prior cause and posterior cause, as when we say that both the art and the doctor are the cause of health, but the art is the prior cause and the doctor the posterior cause. And the same division holds for the formal cause and the other causes. And notice carefully that we should always lead back a question to the first cause. For example, if we ask "why is this man healthy?" the answer is "Because the doctor healed him" And so we should ask again, "By what means did the doctor heal him?"--"Through the act of healing which he possesses."

It should also be noted that posterior cause is also called proximate cause and prior cause, remote cause. Hence these two divisions of causes--prior and posterior, remote and proximate--signify the same thing. However, it should be observed that always what is more universal is called remote cause, what is more

particular is called proximate cause. For example, we say that the proximate form of man is his definition, namely, rational mortal animal; but animal is more remote and substance again more remote. And similarly the proximate matter of the statue is bronze, but the remote matter is metal and the again more remote is body.

Again, (according to another division) of causes, some are essential and some are accidental. A cause is called essential which is the cause of something in so far as it is this kind of thing--for example, the builder is the cause of the house and the wood is the matter of the bench. A cause is called accidental which happens (to coincide with) an essential cause-for example, when we say that the grammarian; builds (a house). For the grammarian is called a cause of the building accidentally, for he does so not in so far as he is grammarian, but in so far as he is builder and it happens that he be a grammarian. And the case is similar in the other causes.

Again, (according to another division) of causes, certain ones are simple, others are composite. A cause is called simple when what is the essential cause is alone called cause or also when what is the accidental cause is alone called cause--for example if we say that the builder is the cause of the house and, similarly, if we say the doctor is the cause of the house. However a cause is called composite when both are said to be causes--for example, if we say the doctor-builder is the cause of the house. A cause can also be called simple in the way in which Avicenna explains it: that which causes without being united to another, as the bronze of statue--for the statue is of bronze without the addition of any other matter--and just as it is said that the doctor produces health or that fire produces heat. However he calls a cause composite when many things must come together in that which is a cause, just as one man is not the cause of the movement of the ship but many and as one stone is not the matter of the house, but many.

Again, (according to another division) of causes, some are actual and others are potential. An actual cause is one which actually causes a thing, as the builder when he is building, or the bronze when a statue is made of it. A potential cause is one which, although it is not causing the thing in act, nevertheless can cause it, as the builder while he is not building. And it should be noted that in speaking of actual causes it is necessary that the cause and the

caused exist simultaneously, such that if one is, the other must also be. For if a builder be in act, it is necessary that he build. And if there is building in act, there must be a builder in act. But this is not necessary in causes which are only potential. And it should be noted moreover that a universal cause is related to a universal effect, while a singular cause is related to a singular effect, just as we say that builder is the cause of house and this builder is the cause of this house.

It should also be noted that in speaking of the intrinsic principle, namely, matter and form, there is an agreement and difference of principles according to the agreement and difference of what results from the principles. For certain things are numerically the same, such as Socrates and this man (in pointing at Socrates). Other things are numerically diverse but the same in species, such as Socrates and Plato, who although they agree as men (human species) nevertheless, differ by number. Also certain things differ according to species but we are the same according to genus; for example, man and ass are both in the genus animal. Again certain things are diverse in genus but are the same only according to analogy; such as substance and quantity, which do not agree in any genus but which are brought together only according to analogy. For they are found together only in that which is being; being, however is not a genus, since it is not predicated univocally, but analogously.

In order to understand this, however, it should be known that something is predicated of many in three ways: univocally, equivocally and analogously. A univocal predication occurs when one thing is predicated according to the same name and according to the same nature, that is, the same definition, as "animal" is predicated of "man" and "ass". For both of these are called "animal" and each of them is a living substance capable of sensation, which is the definition of animal. Equivocal predication occurs when something is predicated of others according to the same name and according to different natures, as "dog" is said of a "barking animal" and a "stellar constellation", which things agree only in name and not in definition or signification; for that which is signified by the name is the definition, as is said in Bk. IV of the Metaphysics. An analogical predication occurs when one thing is

predicated of many, which are of different natures, but of which one some thing is attributed to them, as "healthy" is said of the "animal body", and of "urine", and of the "medicine" but "healthy" does not signify exactly the same thing in all of them. For "healthy" is said of "urine" as of a sign of good health, of "the body", as of its subject, of "the medicine" as of a cause. Nevertheless, all of these natures are attributed to a one end, namely, health. For sometimes those things which are brought together according to analogy, that is in proportion, or comparison, or agreement, are attributed to one end, as is evident in the above example; sometimes in one agent, as "doctor" is said both of one who operates through art and of one who operates without art, such as the midwife--and the same also holds for instruments, but through attribution to a one agent which is the art of medicine. Also sometimes the analogy is based through attribution to a one subject as when "being" is said of substance and of quantity and of quality, and of the other predicaments. For it is not for exactly the same reason that substance is said of being, and quantity, and the others--but all of them are called being by the fact that they are attributed to substance, which is the subject of the others. And, therefore, being is said primarily of substance and secondarily of the others. Accordingly, being is not the genus of substance and quantity because no genus is predicated primarily and secondarily of its species. Being is predicated analogously. And it is in this light that we say that substance and quantity differ in genus, but are the same according to analogy.

Wherefore, of those things which are numerically one, both the form and the matter are numerically one, as in the case of Tullius and of Cicero. Moreover, of those things which are the same specifically, but differ by number, both the matter and the form are not the same numerically but specifically as in the case of Socrates and of Plato. And similarly, of those things which are the same generically, their principles are generically the same, as in the case of the soul and the body of an ass and of a horse which differ specifically but are the same generically. And it is also similar for those things which agree only according to analogy, for their principles are similar only according to analogy or proportion. For matter, form, and privation, or potency and act are principles of

substance and of the other genera. Nevertheless, the matter of substance and of quantity (and similarity with respect to form and privation) differ generically, but agree only according to a proportion which consists in this--just as the matter of substance is related to substance in the nature of matter, so is the matter of quantity related to quantity. However, just as substance is the cause of all the other genera, so the principles of substance are the principles of all the other genera.

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