Topic one
What is philosophy of nature and its relationship to metaphysics?

Relationship and differences between philosophy of nature and philosophy of science

Philosophy is often concerned with the most general questions about the nature of things: What is the nature of beauty? What is it to have genuine knowledge? What makes an action virtuous or an assertion true? Such questions can be asked with respect to many specific fields, with the result that there are fields dedicated to the philosophy of art (aesthetics), to the philosophy of science, to ethics, to epistemology (the theory of knowledge), and to metaphysics (the study of the ultimate categories of the world). ¹

At the same the human person is really an inquisitive being who possesses an intellect. He is also given an insatiable and limitless desire for knowledge and the power of unraveling the mysteries that surround his or her life and the nature that surrounds him or her. The human person is at the same endowed with rationality which is one of his most distinguishing features. Rationality in a nutshell is the quality or state of being rational – that is, being based on or agreeable to reason. Rationality implies the conformity of one’s beliefs with one's reasons to believe, and of one’s actions with one’s reasons for action. This is the reason why Aristotle opined that the human person alone is referred to as a rational animal, Homo Sapiens which also means a wisdom seeking person. ²

In order to understand what the Philosophy of Nature is, it is a significance to understand what is “philosophy”? The term “philosophy” is very ancient. However, since we have studied the course on introduction to philosophy, we shall be very brief here.

The verb “philosophein” was commonly used in the Greek literature and had no reference to any specific discipline, just as the substantive “sophia” that is contained in it or its derivatives. It seems to have acquired its specific and technical meaning in the Pythagorean School; according to some testimonies, Pythagoras might have defined only the gods as wise and himself as philosopher. ³

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¹ Kabata James, Cosmology, A companion yo Philosophical Issues in Cosmology, 3
² Kabata James, Cosmology, A companion yo Philosophical Issues in Cosmology, 3
³ Lorella congiunti, Outlines of the Philosophy of nature, 15
“Philosophy” literally means “to love wisdom”, from Greek “philein” and “sophia”. This nominal and etymological definition (that is, the meaning of the name according to the roots that constitute it) is very revealing and merits due attention. To begin with, philosophy encompasses the dimension of love. The ancient philosophy has reflected a lot on love while distinguishing various different nuances. The principal levels of love are: *eros*, *philia* and *agape*; the three levels are not exclusive but rather complementary to each other and therefore, even if *philia* is taken literally in philosophy, it is necessary to take into consideration all the connotations.

First of all, “love” is identified with *eros*, understood as dynamism, a tendency, an attempt to possess what one does not own, and, once possessed, to continue to desire it still some more. Plato dedicated much reflection to *eros*, especially in the *Symposium* dialogue, where he defines it as follows: ‘‘Love is the desire to possess the good always’.’ Plato, with his ability to use myth to explain the truth, makes Socrates narrate the speech of the priestess Diotima.

According to which Eros is a demon, a demigod, a son of a god, *Poros*, and a mortal *Penia* or poverty. Out of this origin, Eros is rich and poor, he lives in an intermediate situation between beauty and lack of it, which is realized in the form of desire. Eros is a desire for beauty and a need to create beauty. For this reason, Eros triggers a dynamism of dynamic possession that leads upward, a tendency that naturally leads man to rise, more and more towards higher beauties. In the *Symposium*, an escalating ladder is illustrated that moves from the love of the beauty of a body, captures the beauty of the bodies, passes through the love of the beauty of souls, of human activities, of laws, to the love of the beauty of knowledge and finally to the vision of the Absolute Beauty.⁴

**Cosmology**

The word Cosmology comes from two Greeks terms;  
- κόσμος, *Kosmos* – the world.  
- λογία, -*Logia-study of* – discourse or study  
- κοσμολογία

This means that we can define cosmology or philosophy of nature as the study of the origin, evolution, and eventual fate of the universe. Attempting to study the whole universe in a single course may sound as a megalomaniacs dream. However, we shall attempt to study it in a simplified manner. From the etymological classification above; Cosmology “is the philosophical study of the nature and origin of the universe in as far is considered to be a unity and an ordered system

⁴ Cf. PLATO, *Symposium*, 210A-211B.
par excellence." The very subject matter of cosmology is corporeal universe in its ultimate constitution.

We can enlarge our definition by highlighting that Cosmology is an analytical construct but above all it is an object of study, and it can be defined as a set of knowledge, beliefs, interpretations and practices of a society or culture related to explanations about the origins and evolution of the universe as well as the role and the meaning of humans, life, and the world, within the universe or cosmos. A good cosmology involves explanations of the past, present and future of a society, and these explanations are part of its understanding of cosmo-eco-ethnogenesis, and it deals with the origins as well as with the finality and destiny of human beings and of other forms of existence.

Theoretical astrophysicist David N. Spergel described cosmology as a historical science because when we look out in space, we look back in time due to the finite nature of the speed of light. Therefore we can further point that Philosophy of Nature is a special discipline within philosophy. This discipline has as its object the universe of physical beings with their specific structures, properties and causal relationships, examined on the level of their fundamental ontology.

Philosophy of Nature is therefore distinguished from the other natural sciences (physical, biological and cognitive), which, from a modern perspective, are limited to the study of natural phenomena, in as much as they are measurable, and of laws, usually formalized with the help of mathematics, which govern the evolution in time of these phenomena.

According to Aristotelian/Platonic tradition, philosophy is divided into three fundamental dimensions. These are theoretical, practical and productive.

- The theoretic dimension is usually speculative. It studies knowledge for its own sake.
- Practical knowledge deals with the human actions. Here we think of the Latin verb- agree. This is all that can be done by a human person. In practical philosophy we study the morals and human ethics and political philosophy among others.

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5NYASANI M. J., Cosmology, The Philosophy of nature, 1

6 The term cosmology was first used in English in 1656 in Thomas Blount's Glossographia, and in 1731 taken up in Latin by German philosopher Christian Wolff, in Cosmologia Generalis. We should also emphasize that "Cosmos" is just another word for universe, and "cosmology" is the study of the origin, evolution and fate of the universe. Some of the best minds in history - both philosophers and scientists - have applied themselves to an understanding of just what the universe is and where it came from, suggesting in the process a bewildering variety of theories and ideas, from the Cosmic Egg to the Big Bang and beyond. Here are some of the main ones, in approximate chronological order:
• The productive part of philosophy regards the study that has *facere* as the final cause. This involves production of something.
  
  ❖ We can summarize by asserting that theoretical philosophy is interested in truth, practical philosophy is interested in good while productive philosophy is interested in beauty. The three interests are usually connected.

**Different types of cosmology.**

Again it is important for us to recognize that although we have made a good definition so far, there is a possibility of having also different types of cosmology. We shall discuss some of them here.

1. **Physical cosmology** is the scientific study of the origin of the universe, its large-scale structures and dynamics, and its ultimate fate, as well as the scientific laws that govern these areas. Physical cosmology is therefore the branch of physics and astrophysics that deals with the study of the physical origins and evolution of the Universe. This study also includes the study of the nature of the Universe on a large scale. In its earliest form, it was what is now known as "**celestial mechanics**", the study of the heavens.

  ❖ **Physical cosmology** is studied by scientists, such as astronomers and physicists, as well as philosophers, such as metaphysicians, philosophers of physics, and philosophers of space and time. Because of this shared scope with philosophy, theories in physical cosmology may include both scientific and non-scientific propositions, and may depend upon assumptions that cannot be tested.

  ❖ Cosmology differs from astronomy in that the former is concerned with the Universe as a whole while the latter deals with individual celestial objects. Modern physical cosmology is dominated by the Big Bang theory, which attempts to bring together observational astronomy and particle physics. More specifically, a standard parameterization of the Big Bang with dark matter and dark energy, known as the Lambda-CDM model.

2. **Religious or mythological cosmology** is a body of beliefs based on mythological, religious, and esoteric literature and traditions of creation myths and eschatology.

3. **Metaphysical cosmology**, dealing with questions *beyond science*, such as the cause of the origin of the universe, whether its existence is necessary,
whether it has a purpose, its ultimate composition, and even the nature of consciousness, without requiring a religious tradition; and

4. **Esoteric cosmology** - is cosmology that is an intrinsic part of an esoteric or occult system of thought. Esoteric cosmology maps out the universe with planes of existence and consciousness according to a specific worldview usually from a doctrine.

Cosmology usually intrudes into other correlated disciplines such as astrophysics, astrometry, astronomy, astrodynamics, astrogeology and also astrology though in a much narrower way.⁷

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**The Relationship between Cosmology and Metaphysics**

Having defined cosmology we shall now explain in few words what Metaphysics is. After this, it is then the prerogative of the reader to find the relationships that exist between the two disciplines and also some differences though some direction and indication will be given. What is metaphysics in the first place and why do we need metaphysics at all? Etymologically speaking, the word metaphysics came to the vocabulary of classical Greek philosophy.

The word metaphysics was first coined after an expression of an early editor of Aristotle. In this time we can say that its meaning was extremely vague and general. The phrase *ta meta ta physika* was nothing but the collective and ordinary name given to the books of Aristotle that were placed after his treatise on Physics (Greek meta = after, physika = nature). Therefore the word ‘metaphysics’ is derived from a collective title of the fourteen books by Aristotle that we currently think of as making up Aristotle's Metaphysics. Aristotle himself did not know the word. (He had four names for the branch of philosophy that is the subject-matter of Metaphysics: ‘first philosophy’, ‘first science’, ‘wisdom’, and ‘theology’.)

At least one hundred years after Aristotle's death, an editor of his works (in all probability, Andronicus of Rhodes) titled those fourteen books “Ta meta ta phusika”—“the after the physicals” or “the ones after the physical ones”—the “physical ones” being the books contained in what we now call Aristotle's Physics. The title was probably meant to warn students of Aristotle's philosophy that they should attempt Metaphysics only after they had mastered “the physical ones”, the books about nature or the natural world—that is to say, about change, for change is the defining feature of the natural world.

This is the probable meaning of the title because Metaphysics is about things that do not change. In one place, Aristotle identifies the subject-matter of first philosophy as “being as such”, and, in another as “first causes”. It is a nice—and

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⁷NYASANI M. J., Cosmology, The Philosophy of nature, 5
vexed—question what the connection between these two definitions is. Perhaps this is the answer: The unchanging first causes have nothing but being in common with the mutable things they cause. Like us and the objects of our experience—they are, and there the resemblance ceases. (For a detailed and informative recent guide to Aristotle's Metaphysics, see Politis 2004.)

In Metaphysics A.1, Aristotle says that “all men suppose what is called wisdom (sophia) to deal with the first causes (aitia) and the principles (archai) of things” (981b28), and it is these causes and principles that he proposes to study in this work. It is his customary practice to begin an inquiry by reviewing the opinions previously held by others, and that is what he does here, as Book A continues with a history of the thought of his predecessors about causes and principles.

Should we assume that ‘metaphysics’ is a name for that “science” which is the subject-matter of Aristotle's Metaphysics? If we assume this, we should be committed to something in the neighborhood of the following theses:

The subject-matter of metaphysics is “being as such”. This first principle, in the formula of the first row of metaphysics, is "the being as a being”, what is specific to this science which considers the being as being, this is what science looks without which there would be nothing! So metaphysics itself as the science that goes to the first cause, foundational, absolute, namely being in as much as is being. In summary Aristotle himself described his subject matter in a variety of ways: as ‘first philosophy’, or ‘the study of being qua being’, or ‘wisdom’, or ‘theology’. A comment on these descriptions will help to clarify Aristotle’s topic.

The subject-matter of metaphysics is the first causes of things
The subject-matter of metaphysics is that which does not change

PHILOSOPHY OF NATURE AND PHILOSOPHY OF SCIENCE

Philosophy of nature is, therefore, a theoretical discipline, aimed at the knowledge of the bodily beings. It is part of ontology and exists since philosophy exists; in fact, philosophy begins to exist as a philosophy of nature. The epistemological statute of the “Philosophy of the Sciences” is different, in fact consists in the reflection on identity of sciences, and on how human beings know scientifically. Philosophy of science is a branch of philosophy concerned with the foundations, methods, and implications of science. The central questions of this study concern what qualifies as science, the reliability of scientific theories, and the ultimate purpose of science.

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8 Lorella congiunti, Outlines of the Philosophy of nature, 64
The philosophy of science is a reflective dimension of philosophy, as it is not addressed to the knowledge of external reality, but to the knowledge of how human beings know reality, in the specific scientific declination. Therefore, the philosophy of nature is part of ontology, and the philosophy of science is, instead, part of gnoseology. The philosophy of science is also called “epistemology”, although the term is also understood in the extended sense of philosophy of knowledge.9

The philosophy of science is a recent discipline. In fact, human beings have always reflected on the various modalities of knowledge, while the philosophy of science is born as a reflection needed by modern science. In fact, the particular modern and contemporary sciences inaugurated a mode of knowledge somewhat new, that requires new reflections by posing new problems, and above all, the success of the particular sciences, not accompanied by an adequate reflection, has caused the equivocal consideration of the end of philosophy, which in its specific task has been replaced by the same sciences. Therefore, philosophy generally retains only the role of reflection, not anymore on reality, but on those same particular sciences, now considered the unique forms of knowledge of reality.10

Indeed, a correct philosophy of the sciences should help to identify and distinguish the various sciences, thus justifying not only the particular sciences, but also the philosophical science as well as the theological science.

The philosophy of nature and the philosophy of sciences are two parts of philosophy well distinct and in fact not directly “linked” to each other, as one arises on the ontological side, the other on the gnoseological one. In truth, in the great body of philosophy all levels are connected, and between the philosophy of nature and the philosophy of science arises a relationship that should not be neglected (considering also how much in the common imagination and, unfortunately, even in certain academic areas, the two disciplines are even confused).11

Surely the boundary problems are many, but between the two disciplines is well worth the distinction, to avoid that philosophy of nature loses its identity, being reduced only to reflection on the sciences of nature.

9 Lorella congiunti, Outlines of the Philosophy of nature, 15
10 Lorella congiunti, Outlines of the Philosophy of nature, 64
11 Lorella congiunti, Outlines of the Philosophy of nature, 64
The philosophy of science – properly set – should conduct a profound reflection on the philosophy of nature as a philosophical science and, in particular, on the relations between this and the particular sciences of nature. On the basis of the misunderstandings surrounding the knowledge of nature, it was considered appropriate to dedicate an initial chapter to the reflection on sciences (whose most appropriate place would be a manual of Philosophy of Science).\textsuperscript{12}

\textbf{TOPIC 2}

The Relationship between particular sciences of nature and the philosophy of nature, the method of particular sciences (Hypothetical, deductive, mathematical, experimental)

The Relationship between particular sciences of nature and the philosophy of nature

Sciences are concerned with the uniformity of operations and events. Uniformity must be established against time and space standards, which involve measurement. It also involves a theory of experiment. If I wish to rule out the possibility that such uniformity is the result of chance, I must prove my point by attempting to observe all the conditions before an event, note the consequences of these conditions to see whether the consequent follows invariably, generally, variably or only occasionally. In any event, in order to clarify the regularity of the consequences for the variable and occasional, and to establish the sequence of antecedent-consequent, I must try to control the ideal conditions.\textsuperscript{13}

This means I must \textbf{experiment}. Experiment plays many roles in science. One of its important roles is to test theories and to provide the basis for scientific knowledge. It can also call for a new theory, either by showing that an accepted theory is incorrect, or by exhibiting a new phenomenon that is in need of explanation.\textsuperscript{14} It is only through experiments that I can work around a statistical average that out of $N$ number of experiments involving $N$ physical conditions I get $N$ predictable results.

A hypothesis is a proposed explanation for a phenomenon. For a hypothesis to be a scientific hypothesis, the scientific method requires that one can test it. Scientists generally base scientific hypotheses on previous observations that cannot satisfactorily be explained with the available scientific theories. Even though the words hypothesis and theory are often used synonymously, a scientific hypothesis

\textsuperscript{12} Lorella congiunti, \textit{Outlines of the Philosophy of nature}, 64
\textsuperscript{13} Foley, L. A, \textit{Cosmology, Philosophical and Scientific}, 11
is not the same as a scientific theory. A working hypothesis is a provisionally accepted hypothesis proposed for further research.\textsuperscript{15}

Basically, then, we can see that the fundamental difference between cosmology and the physical sciences lies in the type of thinking and the area of investigation proper to each. Anyone who has attained a certain and causal knowledge concerning a given subject is said to have achieved a scientific knowledge of the subject in question.\textsuperscript{16}

Cosmology directs its investigation of reality toward an understanding of the essences of real bodies through knowledge of their ultimate principles. In seeking this kind of knowledge, cosmology involves thinking that is both analytic and synthetic. Analytic and synthetic thinking is a type of thinking which abstracts the essence or nature of things and demonstrates the natural effects of such a nature.\textsuperscript{17}

The physical sciences, on the other hand, concentrate on an area that is quite different. Although they do involve abstraction, in as much as they are intellectual disciplines and must, consequently, leave out of consideration (abstract from) individual differences, they are not abstractive in the sense of eidetic abstraction or abstractive induction, which gives insight into the nature or essence of things.\textsuperscript{18} Moreover, they are dialectical, hypothetical, in their conclusions; they seek to determine the uniformity of events and to extend this uniformity into fields that seem to show the same physical conditions that give rise to probable conclusions.\textsuperscript{19}

In science, a formula is a concise way of expressing information symbolically, as in a mathematical formula or a chemical formula. The informal use of the term formula in science refers to the general construct of relationship between given quantities. In mathematics, a formula generally refers to an identity which equates one mathematical expression to another. With the most important ones being mathematical theorems. Syntactically, a formula is an entity which is constructed using the symbols and formation rules of a given logical language.\textsuperscript{20}

This extension of concepts means that the physical sciences generally reason from concept to concept rather than from thing-to-concept. The basis for such reasoning is the congruence of concepts. The sciences consider matter as measurable, whereas cosmology considers its nature as intrinsically changeable,
regarding measurability as a property flowing from its nature. The emphasis of science upon the measurability of matter derives only from the obvious need of measurement to discern uniformity.

Another difference between cosmology and the physical sciences concern the role of deduction in each. Francis Bacon, it may be recalled, had charged that philosophy is exclusively deductive-and that-the, Physical sciences are exclusively inductive: Bacon's thesis might have been true of the decadent philosophy at his time. Moreover, it is obvious that philosophy, as a science, uses deduction a great deal insofar as it uses logic a great deal. Deduction is a logical method. Today the opposite of Bacon's thesis is more correct. Philosophy always is and always must be inductive because it must analyze its findings in order to learn the essences and ultimate principles of-objects. On the other hand, scientific reasoning has become almost exclusively deductive.

The other difference between cosmology and the sciences comes from the fact that cosmology follows the direct appeal to reality and makes primary use of abstracted notions. The sciences must depend heavily upon working concepts. The final great difference between cosmology and the sciences has been seen earlier. It concerns the distinction between perfect (or universal) and particular sciences. Cosmology is a perfect science. That is, it is self-contained. It has the means within itself to answer the questions that it raises. The sciences, on the other hand, often have to go outside of their own fields for the fuller solution of the problems they raise.21

The greatest difference between cosmology and the sciences, however, is that first mentioned, namely, the manner in which they get the information on which they erect their basic principles. Cosmology starts with the intuitive realization that things are, that they change, and that there is a pattern of stability within the constantly changing universe.22 Thus, the mobile being that cosmology undertakes to explain indicates in its mobility the change that is characteristic of the universe and in its being the stability of the components of the universe. This presents us, then, with the problem of being and becoming, the first truly philosophical problem undertaken by Greek and subsequent western philosophy. The sciences, on the other hand, start with some outstanding aspect or property of being and make great use of working concepts in the development of their principles. In order to see this point more clearly, we shall now comment on what are called the formal and material objects of cosmology.23

21 Foley, L. A, Cosmology, Philosophical and Scientific, 17
22 Foley, L. A, Cosmology, Philosophical and Scientific, 17
23 Foley, L. A, Cosmology, Philosophical and Scientific, 17
The Scientific Method

The scientific method is a systematic way of learning about the world around us and answering questions. The key difference between the scientific method and other ways of acquiring knowledge are forming a hypothesis and then testing it with an experiment. Though there are diverse models for the scientific method available, in general there is a continuous process that includes observations about the natural world. People are naturally inquisitive, so they often come up with questions about things they see or hear, and they often develop ideas or hypotheses about why things are the way they are. The best hypotheses lead to predictions that can be tested in various ways. The most conclusive testing of hypotheses comes from reasoning based on carefully controlled experimental data. Depending on how well additional tests match the predictions, the original hypothesis may require refinement, alteration, expansion or even rejection. If a particular hypothesis becomes very well supported, a general theory may be developed.

The Six Steps

The number of steps varies from one description to another, mainly when data and analysis are separated into separate step, but this is a fairly standard list of six scientific method steps, which you are expected to know for any science class:

Purpose/Question
Ask a question.

Research
Conduct background research. Write down your sources so you can cite your references. In the modern era, a lot of your research may be conducted online. Scroll to the bottom of articles to check the references. Even if you can't access the full text of a published article, you can usually view the abstract to see the summary of other experiments. Interview experts in a topic. The more you know about a subject, the easier it will be to conduct your investigation.

Hypothesis
Propose a hypothesis. This is a sort of educated guess about what you expect (see examples). It is a statement used to predict the outcome of an experiment. Usually a hypothesis is written in terms of cause and effect. Alternatively, it may describe the relationship between two phenomena. One type of hypothesis is the null hypothesis or no-difference hypothesis. This is an easy type of hypothesis to test because it assumes changing a variable will have no effect on the outcome. In reality, you probably expect a change, but rejecting a hypothesis may be more useful than accepting one.
Experiment
Design and perform an experiment to test your hypothesis. An experiment has an independent and dependent variable. You change or control the independent variable and record the effect it has on the dependent variable. It's important to change only one variable for an experiment rather than try to combine the effects of variables in an experiment. For example, if you want to test the effects of light intensity and fertilizer concentration on plant growth rate, you're really looking at two separate experiments.

Data/Analysis
Record observations and analyze what the data means. Often, you'll prepare a table or graph of the data. Don't throw out data points you think are bad or that don't support your predictions. Some of the most incredible discoveries in science were made because the data looked wrong! Once you have the data, you may need to perform a mathematical analysis to support or refute your hypothesis.

Conclusion
Conclude whether to accept or reject your hypothesis. There is no right or wrong outcome to an experiment, so either result is fine. Note accepting a hypothesis does not necessarily mean it's correct! Sometimes repeating an experiment may give a different result. In other cases, a hypothesis may predict an outcome, yet you might draw an incorrect conclusion. Communicate your results. The results may be compiled into a lab report or formally submitted as a paper. Whether you accept or reject the hypothesis, you likely learned something about the subject and may wish to revise the original hypothesis or form a new one for a future experiment.

Sometimes There Are Seven Steps
Sometimes the scientific method is taught with seven steps instead of six. In this model, the first step of the scientific method is to make observations.
Really, even if you don't make observations formally, you think about prior experiences with a subject in order to ask a question or solve a problem.
Formal observations are a type of brainstorming that can help you find an idea and form a hypothesis. Observe your subject and record everything about it. Include colors, timing, sounds, temperatures, changes, behavior, and anything that strikes you as interesting or significant.
Part THREE.
What are the Corporeal Natural Substances (Synolon of matter and Form)
The Accidents of Corporeal Substances?

Introductory synthesis
Substance is an undivided Unitarian reality in itself and distinct from the others, easily distinguishable from aggregates of individuals. This deep unity has in itself a composition that is manifested in its becoming: the substance is in fact something that can become, possesses an indetermination that can be determined time by time, a margin of possibility, which is also the sign of the imperfection of things.

In order to explain permanence and change, identity and lack of it, the unitary composition of two principles is necessary; for this reason, we think of the substance as composed of a principle of determination, responsible for permanence and identity, and a principle of uncertainty and determinability, bearer of possibility of change and shortcomings to be fulfilled. Using the pair of concepts “potency” and “act”, we can further clarify that in the substances there is a principle of actuality, whereby one thing is determined in a certain way, and there is a principle of potentiality, which is the ability to receive an act, a determination. Using classical terminology, we will say that each substance is composed of a substantial form (principle of determination, act) and matter (principle of determinability and indetermination, potency).

Every corporeal reality has, therefore, in itself a principle that carries indeterminable potentialities, which is matter. Matter, in fact, could be anything, but still it is nothing. Aristotle calls it “yle”, that is, raw wood to work: something that in itself is amorphous (has no form) and yet has the possibility to receive any form. Likewise, the Latin materia indicates the wood to build, against the lignum which is firewood.
Each reality also possesses a principle of actuality, precisely the form (morphe), which causes the matter to be determined in tree, plant, animal, etc. The bodily substances are therefore hylomorphic, as they are an inextricable union (synolon) of potency and act, matter (ylo) and form (morphe). There is no separate matter and substantial form, but they are co-principles of bodily substance. The corporeal substances are therefore composed, and their fundamental composition is that of substantial form and prime matter. The prime matter is determined by the substantial form to be in a determined way. The prime matter and the substantial form do not exist alone but are two fundamental principles that constitute the substance of a body.

The Substance theory

This theory asserts that substances are the ultimate things in the universe. Aristotle believes that all material substances are made of matter and form. He defends his position on material substances in his book of Metaphysics. According to him Matter and form are parts of substances, but they are not parts that you can divide with any technology. Instead matter is formed into a substance by the form that it has.

According to Aristotle, matter and form are not material parts of substances. The matter is formed into the substance by the form. Consider a particular plant. That plant is a material substance. So it has both matter and form. The form is the arrangement, nature and state of the plant. So a plant has an internal order that changes as the plant matures. It gains nutrients from the environment, removes waste and grows. Each of these functions is a part of the plant. It is not possible to separate the activity of the plant from the actual plant.

This is even true at the cellular and atomic level. The cells of the plant are plant cells doing the activities needed to happen in that particular plant. The atoms are joined in a pattern that has different properties than any of the individual atoms, but that serves the needs of the plant. At all levels, the plant’s form determines the properties and activities of every physical part of the plant. The matter just is determined by the plant so that particular activities and properties appear.

Aristotle believes that this applies to every material substance – not just plants. He also believes that without a form, matter would have no properties or activities at all. Therefore, every material thing has a form. Since matter and form combine to make material substances, all matter is formed by a form to make a material substance.

Aristotle believes in this particular account of matter and form because it uses substance theory and the four causes to explain how to connect form and matter. Logically speaking, it is the only way to connect the two theories. Form
explains what makes substances one thing rather than many things. So matter and form cannot be two different (material) things. They must join together to make one thing – the same thing that the form is. Therefore, this entire account depends on the accuracy of substance theory and the four causes.

Aristotle famously proposed that every physical object is a compound of matter and form. This doctrine has been called “hylomorphism”, a portmanteau of the Greek words for matter (hulê) and form (eidos or morphê). Highly influential in the development of Medieval philosophy, Aristotle’s hylomorphism has also enjoyed something of a renaissance in contemporary metaphysics.

While the basic idea of hylomorphism is easy to grasp, much remains unclear beneath the surface. Aristotle introduces matter and form, in the Physics, to account for changes in the natural world, where he is particularly interested in explaining how substances come into existence even though, as he maintains, there is no generation ex nihilo, that is that nothing comes from nothing.

In this connection, he develops a general hylomorphic framework, which he then extends by putting it to work in a variety of contexts. For example, he deploys it in his Metaphysics, where he argues that form is what unifies some matter into a single object, the compound of the two; he appeals to it in his De Anima, by treating soul and body as a special case of form and matter and by analyzing perception as the reception of form without matter; and he suggests in the Politics that a constitution is the form of a polis and the citizens its matter, partly on the grounds that the constitution serves to unify the body politic.

Aristotle introduces his notions of matter and form in the first book of his Physics, his work on natural science. Natural science is concerned with things that change, and Aristotle divides changes into two main types:

There are **Accidental Changes**, which involve concrete particulars, or “substances” (ousiai) in Aristotle’s terminology, gaining or losing a property. For instance, the changes whereby Socrates falls in a vat of dye and turns blue, or puts on a few pounds from excessive feasting, count as accidental changes (in the categories of quality and quantity, respectively). Socrates, a substance, gains the property of being blue, or the property of weighing twelve stone.

The other main kind of change is **substantial change**, whereby a substance comes into, or passes out of, existence. For example, when Socrates dies, or is born (or perhaps conceived, or somewhere in between conception and birth), a substantial change has taken place.

Matter and form are required to account for this second kind of change, if it is to conform to Aristotle’s general conceptual analysis of change. In any change, he contends, there must be three things:

1. Something which underlies and persists through the change;
2. A “lack”, which is one of a pair of opposites, the other of which is
(3) A form acquired during the course of the change (Physics i 7, 190a13–191a22).

......Socrates learns to play the flute,

Thus, for example, in an accidental change, the underlying thing is the substance which acquires a new accidental property. For instance, when Socrates learns to play the flute, he transitions from a state of being unmusical (the lack) to a state of musicality (the form). But for us to be able to say that there is something which has changed, there must be something which remains the same throughout the change, and in this case the obvious candidate is Socrates, who is one and the same person throughout his musical training.

In accidental changes there is always a substance to underlie the change, but this is not true for substantial changes, since these involve the coming to be or passing away of a substance. In these cases, the thing that underlies is the matter of the substance. When someone builds a house, it is the bricks which persist through the change. They transition from a state of not being a house to acquire the property of being a house. Aristotle often uses the example of artefacts like houses, even though he does not regard them as substances properly-speaking (Metaphysics vii 17, 1041b28–30), because their matter is more straightforward to identify.

The word “form” may misleadingly suggest that what is acquired in a case of substantial generation is simply a shape, and this impression is reinforced by some of the examples that Aristotle uses, especially when focusing on artefacts: plausibly the form of a bronze statue just is its shape. When we consider organisms, however, it becomes apparent that having the right shape is not sufficient to possess the form. A thing’s form is its definition or essence—what it is to be a human being, for example. A statue may be human-shaped, but it is not a human, because it cannot perform the functions characteristic of humans: thinking, perceiving, moving, desiring, eating and growing, etc. The connection between a thing’s form and its function emerges in Physics ii 3, where Aristotle distinguishes his four kinds of cause: material, formal, efficient, and final, and suggests a special connection between the formal and final cause.

Here one needs to proceed cautiously, however, since it is sometimes said that Aristotle’s word “cause” (aitia) would be better translated as “explanation” (or “explanatory factor”, to avoid the implication that they are linguistic items, as opposed to things-in-the-world).

Aristotle’s Metaphysics on substance

Aristotle’s Metaphysics has as its central theme an inquiry into how substance may be defined as a category of being. Aristotle defines substance as
ultimate reality, in that substance does not belong to any other category of being, and in that substance is the category of being on which every other category of being is based. Aristotle also describes substance as an underlying reality, or as the substratum of all existing things. He describes substance as both formal and material reality, and discusses the relation between potentiality and actuality.

According to Aristotle, the being of any individual thing is primarily defined by what it is, i.e. by its substance. Substance is both essence (form) and substratum (matter), and may combine form and matter. Substance constitutes the reality of individual things. The substance of each individual thing is the particular nature of that thing. The substance of each individual thing is that which does not belong to other individual things, while the universal (principle or element) of an individual thing is that which belongs to many individual things.

Aristotle differentiates between three kinds of substances, according to whether or not change can occur in their actual or potential being. The first two kinds of substances are physical (or material), and are ‘movable’ or ‘changeable.’ These physical substances are capable of changing, or of being changed. They may be either:

1) perishable,
2) imperishable (i.e. eternal).
3) The third kind of substance is non-physical, non-material, eternal, ‘immovable,’ and 'unchangeable.'

**Non-material substances may include:**

1) mathematical objects (such as numbers),
2) Ideas.

The elements of a substance may be singular (one) or multiple (many). A simple substance may consist of only one element. A composite substance may consist of many elements. The same elements may be shared by many different kinds of things. However, Aristotle says that eternal substances do not consist of elements, because elements may not always be the same in a substance, and because elements may not exist eternally.