UNIT 3 MATTER AND FORM

Contents

3.0 OBJECTIVES

Materiality underlies all material things. Formality underlies all finite beings with material forms. The principle of materiality is prime matter and the principle of formality is substantial form. In this Unit an attempt is made to:

- Understand the classical views on prime matter and substantial form
- Explain the classical views in its relation to the contemporary scientific theories on matter: quantum mechanics and theory of relativity

3.1 INTRODUCTION

Hylomorphism, the classical theory of matter and form, is derived from the Greek words '*hyle'* (matter) and '*morphe'* (form). This theory of Aristotle seeks to explain the essential constitution of a corporeal substance in terms of a twofold principle: prime matter and substantial form. Prime matter is material and indeterminate, and substantial form is formal and determining.

3.2 CLASSICAL VIEWS

Plato distinguished between matter and form, but Aristotle is the author of hylomorphism. St. Augustine held a theory of matter and form, but the importance of hylomorphism was not realized before the Middle Ages. Scholastic philosophers adopted Aristotle's theory although they differed in their interpretation of it. The pure potentiality of matter was denied by *Duns Scotus*, but defended by Aquinas and his followers. Suarez calls matter pure potency, but attributes a kind of actual existence to it. Albert the Great, the nominalists, and Suarez denied the necessity of an intrinsic principle of limitation. Regarding the principle of individuation, Duns Scotus sought the solution in adding to the specific nature the form of 'thisness,' which is formally distinct from the specific nature but actual on the part of the thing. The nominalists denied that there is any basis for a problem of individuation. Suarez held that an essence is individual by its very entity. Plato and Aristotle appealed to matter. St. Thomas developed Aristotle's theory by adding to matter the qualification 'marked by quantity'. While the entire Thomistic school admits this formula, there is a difference of

opinion about its interpretation, and even about the sense which St. Thomas ultimately intended to give to it. Sylvester of Ferrara (1474-1528), followed by Boyer and Renard, explain this quantity as the actual quantity of a body; whereas Cajetan (1469-1534) and more recently Remer, Gredt, and Phillips explain it as the transcendental relation of matter to quantity. Rosmini (1797-1855) and some others have tried to explain individuation by means of existence

3.3 SCIENTIFIC VIEWS

Our normal tendency is to depict matter and the material world as we observe it, but the theories of quantum mechanics and relativity critically challenge our way of looking at matter.

Quantum Mechanics: Mechanics, a branch of physics, deals with the movement of bodies. Quantum mechanics deals with the movement of quantum particles. It was developed in the 1920s by an international group of physicists, including Niels Bohr (1922-2009) from Denmark, Louis de Broglie (1892-1987) from France, Erwin Schroedinger and Wolfgang Pauli from Austria, Werner Heisenberg from Germany, and Paul Dirac from England. The subject-matter of quantum physics includes the movement of particles, creation of particles, destruction of particles, interaction between particles, the way atoms are tied to the nucleus, the nuclear forces, the properties of particles, the conception of the beginning of the universe as a great quantum leap, etc.

The theory begins with Max Planck, a physicist, who brought forth the first crucial idea of the quantum theory in 1900. This theory states that energy absorption and emission take place in discrete quantas. In his view, our continuous view of the world must be replaced by a discrete one. The different forms of energy in the universe are discrete and imperceptible. To know Quantum mechanics is to know the subatomic world, which is a world of puzzles, paradoxes and perplexities ruled by chaos, randomness, and probabilities. The subatomic units of matter have dual aspects. They appear sometimes as particles and other times as waves. This is a very strange property of matter understood in terms of probabilities. Probability means we can never predict an atomic event with certainty. Mechanical stability of particles is yet another puzzle whereby atoms colliding millions of times every second will return to the original form after a collision. Again, the subject-object distinction of the macroscopic world does not exist clearly in the microscopic world.

The principles of classical physics collided with the new concepts of indeterminacy, randomness, and unpredictability. The development of quantum physics marked the beginning of the age of the 'new physics,' radically altering the physicist's conceptions of reality. The new vision of matter in quantum physics is generally termed as the philosophy of quantum mechanics. The two fundamental principles of quantum physics are the principle of complementarity and the principle of uncertainty. The principle of complementarity proposed by Niels Bohr was meant to explain the wave-particle duality of light. According to this principle, wave and particle are mutually exclusive but complementary aspects of light. They are mutually exclusive in the sense that when one is manifest the other is not manifest. According to the principle of indeterminacy or the uncertainty principle of Heisenberg, it is impossible to determine exactly both the position and momentum of a particle at the same time.

Relativity: The theory of Relativity, proposed by Albert Einstein (1879-1955), is one of the most significant scientific advances of our time. The central problem in physics in the nineteenth century was concerned with resolving the problem of Newton's 'action at a distance' and the wave propagation of light. It was necessary to postulate a medium, first to transmit force between two bodies and then as a medium for light to travel as a trans-wave.

Einstein's inventive theory as a solution to this problem gave rise to the theory of relativity, which holds that concepts like mass, motion, length, time, simultaneity, etc., are not absolute but relative. They are relative to the frame of reference. There are two kinds of relativity theories: the Special Theory of Relativity and the General Theory of Relativity. Special Relativity discusses situations when bodies move with uniform velocity. There are two postulates that are central to the special theory of relativity. The first states that there is no privileged frame of reference. All frames of reference which are moving with uniform velocity with regard to each other are equivalent, and therefore the laws of physics are equally applicable in all frames of reference. The second postulate holds constancy of the velocity of light, which is an absolute universal constant as the maximum interaction speed between two bodies is the speed of light and this is independent of the motion of the source of the observer.

According to the first postulate, all natural events are unaffected by uniform motion. Motion makes sense only when referred to a frame of reference. There is no absolute length, time, and mass. These have different values in different frames of references. The Special Theory of Relativity also holds that those events which are simultaneous in one frame of reference need not be simultaneous elsewhere. It also limits the maximum speed of interaction to the velocity of light. Nothing can move faster than light, and if anything moves faster than light it would contract to nothing.

Relativity of length and relativity of time are two important consequences of the special theory of relativity. Length is not something absolute in the sense that it has the same value for all persons at all places. Length is relative depending on the frame of reference. For instance, the length of a rod is four feet when measured by a stationary observer; the same rod will have a length less than four feet when it is placed in a fast moving frame of reference like a super space-shuttle for the same the stationary observer.

Time also is relative. A moving clock slows down with respect to a stationary observer. This means that if two exactly identical clocks are synchronized, but one is kept in a stationary frame of reference and the other in a moving one, the second one will show a lower reading than the first. Not only clocks, all other time-related phenomena too slow down in a moving frame of reference.

According to this theory, there is no absolute past, present, or future applicable to the cosmos as a whole. Similarly, two events that are simultaneous in one frame of reference need not be so in another frame of reference. Relativity of mass and the equivalence of mass and energy, are another amazing twin consequence of the special theory of relativity. Einstein also showed that mass too varied being relative to the frame of reference. A moving body has a greater mass than a stationary one. Perhaps the most far-reaching consequence was the mass-energy equivalence, according to which mass and energy are inter-

convertible. Mass can be converted into energy: *E = mc2*. Energy depends on its inertial mass and the velocity, and therefore energy can increase either with the increase of mass or velocity.

The General Theory of Relativity is the theory of gravitation which deals with bodies with accelerated motion (non-uniform motion). The concept of accelerated motion consists of change in speed or change in direction. The two postulates for the general theory of relativity is the principle of equivalence and gravity, which is defined as the curvature of space-time continuum. The first postulate signifies the equivalence of accelerated motion and gravity. The second postulate of the General Theory of Relativity defines gravity as a geometrical property by which the presence of a huge mass can curve the space-time continuum. This aspect of relativity sees gravity not as a force (as held by Newton) between bodies but as a geometrical property.

A significant result of the theory of relativity is the happy blending of classical metaphysics and modern physics. Classical metaphysics views matter (prime matter) as the principle of indetermination, and form as the principle of determination. Matter in itself is capable of receiving any form. Matter remains relative to a form. This fundamental nature of relativity and indeterminacy of matter is the ultimate metaphysical foundation of the physical theories of quantum mechanics and relativity. Thus, the classical conception of prime matter as the principle of indetermination continues to be relevant in the context of the new findings of physics.

3.4 PRIME MATTER

All material beings possess a principle of materiality. It is not a being at all but a principle of material beings as such. Hence it cannot be known scientifically (empirically), but metaphysically. This principle of materiality is traditionally known as prime matter. It is the common substantial principle found in all material bodies. It is wholly without determinateness in itself. It cannot exist itself. It is substantial, but an incomplete substantial principle. It requires another substantial principle to exist, or rather to give it existence in a determinate body. The other substantial principle (with the exception of human soul) is also an incomplete substantial principle. The prime matter is the determinable element and the substantial form is the determining element. It is also pure potentiality as it is a pure capacity for existence in a material body. It is a capacity which must be filled up, determined, and made into the only existible body by a substantial principle other than itself. Since the result of the union of this determining principle with prime matter is a single bodily substance, the union itself must be a substantial union, the substantial fusing of two substantial principles into an actuality which is a third thing. This third thing is neither prime matter alone nor substantial form alone, but an existing body of a specific kind. It is that which makes any body a body, not actively but passively receiving the impress and union of the substantial form. For the whole character of prime matter is its passivity, its inertness, and its indifference to become this particular kind of body rather than another in a word, its indeterminateness, its *potentiality.* In this way we can affirm the classical Aristotlean assertion: *Prime matter is that constitutive principle of corporal substance which of itself is quite indeterminate and hence can be determined to form corporeal substance*. The following are the main characteristics of prime matter:

Prime Matter as the Principle of Imperfect Individuation

Individuation is the adequate distinction of one being from another. *Imperfect individuation* is the adequate distinction of beings which fall within the same species, e.g., the distinction between different individuals of the human species. *Individuality* or individuation is the unity of a being which is *one in itself and non-multipliable.* An individual is an existing unit of being incapable of being multiplied. An individual is one in such a manner that it cannot be divided. 'Individual' is in opposition to 'universal'. The universal is a nature common to-one-and-many. It is capable of being realized in any number of individuals of the same class. As a class-nature it is conceived as a unit. Since it is communicable to many, it is multipliable. On the other hand, the individual nature is one for itself alone so that it is incommunicable to others. The individual nature, as an existing individual incommunicable to many, is non-multipliable.

What is the principle of individuation which makes a being to be an individual? We can distinguish between an extrinsic and an intrinsic principle of individuation. The extrinsic principle is the efficient cause which gives an individual being its existence. The intrinsic principle is the ground or reason in the being itself which gives individuality to the being, so that it is one in itself and non-multipliable into many. In other words, what is it in the being itself that makes it to be 'this' individual. Since this question refers to the single individual, taken absolutely and without any relation to others, this intrinsic principle is called the *principle of absolute individuation.* It is the intrinsic principle which gives the unity of individuality to a being. In order to understand the problem rightly, we must compare the individual nature of a being with its specific nature.

Individual Nature and Specific Nature

The specific nature of a being is the result of the union of its proximate genus and specific difference. For instance, the specific nature of human consists of the proximate genus 'animal' and the specific difference 'rational'. The union of the two constitutes the specific nature of human who is a 'rational animal'. The specific nature is alike in all humans; for all humans possess the nature of a rational animal. From this standpoint alone there would be no difference in the concept of one human and another. In an existing human this general 'specific human nature' becomes an 'individual human nature'. This is done through the union of the 'specific nature' with 'individuality'. For instance, Napoleon, through his individuality, is not merely a man, *but this man Napoleon*.

Still the question is: What is the principle of absolute individuation which makes an individual to be individual? Is individuality a reality really distinct from the reality of the specific nature? In this case, the principle of absolute individuation would be the entity of the individuality as such, and not the nature at all. Or, are the specific nature and individuality in an existing individual entitatively identical, with merely a distinction in thought between them, so that they form a *metaphysical union*? In that case the formal principle of absolute individuation would be the entity of the individual nature or essence itself, and there would be only a virtual distinction between individuality and specific nature in an individual being. The latter view is preferred and it can be demonstrated in this way: The specific nature in itself must either be a universal or an individual nature. If it is universal, then a universal nature would exist as a universal. However, a universal nature cannot exist in the physical order of things as a universal. Therefore, the

specific nature must exist as an individual nature. But if it comes into existence as an individual nature the entity of individuality is entirely superfluous and can no longer make it individual as it is already an individual nature in itself when it comes into existence. Hence the individuality of an existing nature is not really distinct (but only mentally) from the existing nature itself, and the principle of absolute individuation of an individual is the nature or essence itself. In other words, every specific nature becomes an individuated nature. Therefore, individuality is solely a manner of existence for nature. Then, the distinction between the specific nature and the individuality of an existing individual is a mental or logical distinction. They are distinct in concept because we define them differently. The question is: Is there a ground or reason or foundation in the individuals for making this distinction in concepts? It can be answered in this way: Individuality is the same for all beings. It is that which makes a specific nature to become individuated in this particular individual. But there is a great variety of specific natures among existing beings, each of which is individuated in a large number of existing individuals. Here we have the ground or foundation in the things themselves, for our making a mental or logical distinction between the nature and the individuality in them. Now when there is such a foundation for making this distinction, the distinction is neither real nor purely mental, but virtual. Therefore, there is a virtual distinction between the nature and its individuality.

The next question is: What is the principle which individuates a specific nature into a number of individuals or individual natures? This is the *principle of relative individuation*. The principle of relative individuation is *matter affected or signated by dimensive quantity*. It can be explained in this way: Since it is a question of the plurality of individuals in the same species, the principle of individuation must be a principle of plurality. Plurality implies division and divisibility. The ground of divisibility will also be the ground or principle of plurality. Consequently, the ground or principle of relative individuation must be that ground of divisibility which enables a specific nature to be multiplied into a plurality of individual natures. Now, in physical order the principle of divisibility is matter affected by dimensive quantity. When a portion of matter is separated from another, a plurality is effected in it which gives rise to a plurality of individuals of the same species.

Prime Matter as the Principle of Quantity

Quantity is that which is one, yet divisible. There are two types of quantity: multitude and magnitude. *Multitude* is the composition of the discontinuous parts which are the subjects of the same species, e.g., multitude of humans. *Magnitude* is the composition of the continuous parts of a corporal being, e.g., a huge tree.

Prime matter as the Principle of Mutability and Passivity

Mutability is the ability to change. There are two kinds of mutability: substantial mutability and accidental mutability. *Substantial mutability* is the ability to become an individual of another species, e.g., food becoming part of the one who eats it. *Accidental mutability* is the ability to undergo a change of accidents, e.g., a change in the weight of body or a change of opinion. *Passivity* is the ability to receive some perfection from another.

Prime matter as the Principle of Being -present-to-another

Every being necessarily acts. The activity of the spirit is spiritual, which implies luminous self-awareness or knowledge. Hence, the pure spirit is primarily present to itself and only then is it present to the other. Human knows about the other first. One knows about oneself only afterwards. Hence, human is not pure sprit. There is in human a non-spiritual principle, namely, prime matter which is the principle of being-present-to-another.

3.5 SUBSTANTIAL FORM

To illustrate the various senses in which the term *form* is used, we shall consider a few instances of its use: Form is frequently used as a synonym for outline or shape. We speak of the ovular form of a race-course, of the symmetrical form of a drawing. It also means a plan or program, a record, or a form-sheet to be filled. It is often used for *good condition*, and a golfer is said to be 'in form' or 'at the top of his form'. The adjective of form (i.e., formal) is often employed to indicate a certain dignity, or a certain decorum invoking precise details of dress or conduct. Thus we speak of 'formal dresses, a 'formal occasion', a 'formal introduction' etc. To a philosopher, form may mean that which *determines* a thing, sets it in its being, in its essence, in its substance, in its accidents, in its actuality. Any determining element is a being in form. When it is spoken of corporeal substance the term refers to *substantial form* which makes a bodily substance an existing reality (actuality). It is the substantial form of human which makes the one bodily being a human being. *That which sets and determines a substance in its actual being, and makes it a substance of this precise kind or essential nature, is its substantial form.*

Of course, human, dog, tree, coal, hydrogen, computers, etc. have *accidental forms* too. The human being will be of a certain age, sex, size, nationality, condition of health, temperature, location and so on. These many and variable forms do not constitute human's substance as this kind of *actual body*. They are *accidental* forms, not *substantial forms.* Each individual body has only one substantial form, but a plurality of accidental forms. 'Each individual body' means a *continuous body*. Now, any living body is continuous throughout its living structure. A lifeless body is strictly continuous at least in its minimum particles. In other words, the individual body, which is a single continuous quantity, is actuated only by one substantial form, but it *may be divided* into a plurality of individual bodies of the same species. Each of the bodies so resulting has its own substantial form. For instance, a rosebush may be cut and divided into several rose-bushes. The undivided bush has only one substantial form *actually*. But in the plant in question, the bodily substance is capable of division in such a way that life may be preserved in each of the parts. Thus, the plant has a potentiality or capacity for such division, and its substantial form is said to have a parallel potentiality or capacity by reason of its dependence upon the matter of the plant. Hence we can say that the rose-bush is actually one, but potentially many. Similarly, we can also say that the *substantial form of the rose-bush* is actually one, potentially many. Substantial forms of the human souls, and that of most animals, are never multiple either actually or potentially. Each of such forms is necessarily *one* substantial form having no capacity for division according to division of the body-structure (matter) on which, intrinsically or extrinsically, it depends.

In a living body, the life-principle (soul, entelechy) is the substantial form. When this form is driven out by death, the remaining structure is substantially different from the living body. The corpse of a human is not a human. It is a package of various inorganic (non-living) substances and naturally tends to break up, or decomposes. Hence, a corpse is not a single substance but a mixture of many substances; whereas the living human, actualized by the spiritual substantial form (soul) is a single human substance.

Substantial change involves the acquisition or incoming of a new substantial form and the simultaneous loss or outgoing of the old substantial form while the prime matter remains. When a living body is changed to a dead body, there occurs a substantial change. Again, when hydrogen and oxygen are brought together in due proportion, the gases are changed into water. The properties of water are not the same as those of the gases. Here, we know that the change is a change of substance. The two substances have become a single compound substance called water. Therefore, substances manifest their character by their properties. When the properties are wholly changed we know that the substance is changed. Inasmuch as the change results in the production of a new substance (substances) it is *generation*. The same change, inasmuch as it results in the loss of the previous substantial form, it is *corruption*. The generation of one substance(s) is the corruption of another, and vice versa.

When a compound substance (such as water) is generated by the fusion or union of other substances, we have a *compound.* A compound is a substantial unity. The substantial forms of the elements joined together in a compound, endure in the compound in a *virtual manner,* and not *actually*. For example, the substantial form of water is a true substantial form, distinct from the form of hydrogen and the form of oxygen which are the constitutive elements of water. The forms of these elements can be generated again from water. In other words, these elements are latently or *potentially* present in the water, and not *actually*. And this potential or latent presence of the elements in the water is not a purely passive thing since the water is capable of being reduced to the gases. The potential presence of the elements is a kind of *active* potentiality which is called *virtual*. Thus, we can say that the elements in a compound are present in the compound, not *actually* but *virtually*. To be more precise, the *substantial forms* of the elements are virtually present in the substantial chemical compound.

To have new bodily substance we must have old bodily substance, since bodies come from other bodies by generation and corruption. However, the process of generation cannot proceed in an infinite series of bodies from other bodies, and there from other bodies, and so on for ever. For an actual infinity in anything limited or finite is a contradiction. Hence, the *first* bodily beings cannot have come into existence by way of generation, i.e., by way of substantial change. The *first* finite being must have come into existence by an *absolute* production by the Infinite Power without any material prerequisites. Such a production is called *creation.* It is the *production of a being in its entirety out of nothing.* It is "*productio totius rei ex nihilo sui et subjecti*". It means "the production of a thing is entirety out of nothingness either of self or of subject". *Nothingness* refers to the absence of all pre-existing materials. The calling of being out of nothingness is the exercise of *absolute or unconditioned and unlimited power*. And such power is exercised only by the Absolute and Infinite Being.

Substantial form is an inner principle of primary actualization or determination of a being. It is the inner principle of specific perfection. It is active, and it is determining. It makes a body actual in a definite specific kind of actual bodiliness. The result of the substantial union of substantial form with prime matter is called *second matter or materia secunda*. *Materia secunda* is an existing bodily substance. Substantial form is the root and source of bodily actuality, of substantial determinateness, of activity; whereas prime matter is wholly potential, indeterminate, inactive, or inert. *Kinds of substantial form*: *Pure substantial form* is the inner principle of primary determination which constitutes the whole being, e.g., angels. *Component substantial form* is the inner principle of primary determination which is only a constitutive principle of being, e.g., substantial forms of all material beings. *Subsistent component substantial form* is the inner principle of primary determination which of itself has its act of existing, e.g., the human Soul. *Non-subsisting component substantial form* is the inner principle of primary determination which exists and can exist only insofar as it is in union with matter, e.g., animal forms, vegetative forms, and inanimate forms.

Check Your Progress

Note: Use the space provided for your Answers.

1) How do you explain matter and form from classical perspectives?

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2) How do you relate matter to modern theories of quantum mechanics and theory of relativity?

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3.6 LET US SUM UP

Prime matter is the principle of indetermination, and substantial form is the principle of determination. The theories of quantum mechanics and relativity critically challenge our way of looking at matter. The new vision of matter in quantum physics is generally termed the philosophy of quantum mechanics with its two fundamental principles: principle of complementarity and the principle of uncertainty. The principle of complementarity explains the wave-particle duality of light; the principle of indeterminacy or the uncertainty principle states that it is impossible to exactly determine both the position and momentum of a particle at the same time. A significant result of the theory of relativity is the

happy blending of classical metaphysics and modern physics. Classical metaphysics views prime matter as the principle of indetermination, and form as the principle of determination. Matter in itself is capable of receiving any form. Matter remains relative to a form. This fundamental nature of relativity and indeterminacy of matter is the ultimate metaphysical foundation of the physical theories of quantum mechanics and relativity. Thus, the classical conception of prime matter as the principle of indetermination continues to be relevant in the context of the new findings of physics too.

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