

Vaisesika Darshana of Kanada

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The world view of physics we have today is the modern world view, which is not totally independent, it has been evolved out of the earlier world views, models of physical reality. For example, consider the atomic theory of modern science. John Dalton gave the atomic theory in around 19th century comprising of individual atoms which were considered as indivisible component of the universe. This theory was later extended by Rutherford who explained the concept of proton, neutron and electron, electrons orbiting protons and neutrons and nucleus. John Dalton was inspired by the works of Demetrius in the Greek history (3rd century BC). Demetrius again is not an independent originator of the atomic theory. The Greeks had close contacts with India and in the Vaisesika theory of Kanada atomic theory is very clearly mentioned.

Vedas contain knowledge of all subjects and the Darshanas are a window into perspective of particular subject. In case of Vaisesika it is Physics, in case of Yoga it is Mind or Psychology, in case of Nyaya it is Logic. Logic and physics go together. Logic is mathematics.

The quantitative analysis of the phenomenon observed in the nature is called physics applying mathematics. Quantitative analysis means applying mathematics, qualitative analysis is physics.

Vaisesika sutra only mentions the qualitative treatment and not the quantitative treatment. The quantitative treatment is available in other texts which came later authored by Bhaskara, Varahamedha, Brahmagupta who have applied quantitative techniques of mathematical calculations joined with physics principles of Vaisesika to explain the motion of earth, motion of moon, motion of sun, motion of planets to a very precise extent, to the extent of being able to predict the eclipses.

Logical approach associated with the physical analysis of the universe - Physics which is present in the Vaisesika darshana is evidence to why Sanatana dharmas are scientific and not many other religions.

Vaisesika darshana starts with the Kanada Vaisesika sutras.

Beyond the 5th century AD, works of Prasastapada and others have been slanted or biased or overwhelmed by Nyaya sastra or logic. They have gradually ignored the physical behavior, physical phenomenon of the universe and they kept on talking about only logic and proof all the time without considering the physical phenomenon, Mathematics without Physics.

Vaisesika has its own independent stand as a science of physical world, physical reality, and Kanada's approach towards it is most notable.

The following are some of the sutras from the Vaisesikasutras of Kanada:

अथातो धर्मं व्याख्यास्यामः ॥ १ ॥

**अतः = For this reason, अथ = Then now, धर्मम् = Dharma,
व्याख्यास्यामः = We shall comment upon.**

Now, for this reason, we shall comment upon Dharma.

In Hindi, the word 'dharma' means religion. In Sanskrit the word 'dharma' means the principle of truth, true dharana - the sustaining principle.

Those principles which have sustained in the universe, which are essential for the existence of the universe is called dharma.

Dharma is the goal of the entire human life, civilization, culture, and literature. Mahabharata is known to be a Sastra of Dharma.

Dharma can be multifariously defined and described. Originating from the verb root "dhri" which means to "hold", Dharma stands for Universal Law, Universal Virtue, which holds up this Universe, which sustains and makes this universe function, operate. The Universe is held up due to the Universal Laws - The Laws of Nature, including the Laws of Physics, which is the present subject context in Vaise- sikadarsana. The Laws of Physics are being described in Vaisesikadarsana.

The word 'dharma' in a court means law, only at the social and personal level. But in Vaisesika, it means the law of the physical entities.

In the context of Physics, Dharma can be interpreted as the body of rules and laws which determine the behavior of the physical world, with all its constituents: all forms of Matter, Energy, Space, Time, and forces such as gravitation, electrostatic forces, electromagnetic forces, and their interactions.

यतोऽभ्युदयनिःश्रेयससिद्धिः स धर्मः ॥ २ ॥

स धर्मः = Dharma is that, यतः = from which, अभ्युदय = progress (material progress, economic development, and wealth creation), निश्रेयस = Moksha (or the liberation or emancipation or nirvana) of the individual and society, also known as the highest good, सिद्धिः = is achieved.

Dharma is that from which progress and liberation (highest good) is achieved.

Dharma can be understood from a variety of perspectives: legal, social, moral, religious, individual, universal, and also purely from the physical perspective.

In the context of Vaiseika, the physical perspective may also be considered - the laws on which the Physical world or the physical reality operates can be termed as Dharma of the Physical world. In other words, the science of Physics can be considered as the Dharma of the physical world. Evidently the knowledge of the laws of the physical world, that is, Physics, can lead to material progress (by means of the application to technology which can result in material progress and economic development). It should also lead to the highest good, which is the spiritual enlightenment of the individual and the society, without which plain material progress and wealth creation can lead to unhappy and immoral conditions such as social tensions, violence and terrorism and war as is happening today.

In the example of Ukraine, all the parties involved are highly advanced materialistically, they are not poor countries, but they lack spiritual enlightenment. They are supposed to be Christians but there seems to be no place for love or affection or brotherhood or oneness. Thus, material progress, when combined with the social, moral, and ethical progress, can lead to the highest good, which shall lead to Moksa or Liberation, which is the total freedom and independence of the individual and the society (without which there is dependence and suffering and conflict and violence and war) only such Dharma is essential, which can result both in material progress and spiritual enlightenment.

The reasons why other religions are failing because they fail to bring peace, they fail to stop violence. When there are wars based on religion that means people have not really understood what religion is or what dharma or spirituality is, or what is spiritual enlightenment or spiritual realization.

तद्वचनादाम्नायस्य प्रामाण्यम् ॥ ३ ॥

तत् = that (Dharma as referred in previous sutra), वचनात् = from the word, प्रामाण्यम् = reference (standard), आम्नायस्य = of the Veda.

The Veda acquires Prāmāṇya (or the position being Pramāṇa) or standard reference by virtue of it being the word of Dharma.

Amnaya Veda gets its pramanya being a standard reference book or source because it is dharmavachana.

Veda proclaims dharmat; thus, Veda becomes the pramana or standard reference of knowledge i.e. the Veda becomes the standard by virtue of being the word of that. The word 'tat' in Sanskrit is pronounced wrongly as that in English. It is explained by some commentators of Vaisheshika sutras as Isvaraya and taking Veda as Isvara vachana. A few other commentators take 'tat' as dharmat itself. Though the Vaisheshika sutras have never proclaimed Isvara or described Isvara directly by proclaiming the authority or the affiliation and acceptance of the authority of Veda itself as pramanya, Vaisheshika sutras have indirectly accepted the existence of Isvara. Therefore, the Vaisheshika darshana is aasthika darshana and it is vedic darshana.

Its counterpart Nyaya darshana of Gautama which explicitly refers to Isvara and Nyaya darshana is applied everywhere in Vaisheshika darshana which is another indication that Vaisheshika darshana accepts existence of Isvara and it admits the authority of Veda as pramanya because of its dharmavachana.

Veda becomes the standard of reference of science as science is only a standard reference of universal laws or dharmat of the physical world. All the major commentators of Vaisheshika such as Prasastapada have theistic orientation and have clearly ascribed God's will as the cause of Creation and Dissolution of the Universe. In conclusion it may be stated that while Kanada has not explicitly referred to God, it can be a possibility that he had belief in God's existence, as he has explicitly declared his affiliation to the supreme authority of the Veda, which is an indirect acceptance of God, as the Veda is very clearly theistic and proclaims the existence of God.

**धर्मविशेषप्रसूतात् द्रव्यगुणकर्मसामान्यविशेषसमवायानां पदार्थानां
साधर्म्यवैधर्म्याभ्यां तत्त्वज्ञानान्निःश्रेयसम् ॥ ४ ॥**

धर्मविशेषप्रसूतात् = due to having born of the special qualities of Dharma, तत्त्वज्ञानात् = from the complete (exhaustive) and essential knowledge or the understanding of the, सामान्यविशेष-समवायनाम् = of the generalized, specialized, inherent, साधर्म्य-वैधर्म्याभ्याम् = similar and dissimilar (properties of), पदार्थानाम् = fundamental entities or fundamental substances comprising, द्रव्य= substances or material entities of fundamental nature i.e. the fundamental constituents of the Physical world, गुण = properties or qualities, कर्म = motions, निःश्रेयसम् = the highest good can be achieved.

Having born out of the special qualities of Dharma (the Universal Law) (धर्मविशेषप्रसूतात्) the highest good (निःश्रेयस) can be achieved by the complete knowledge and (exhaustive) understanding (तत्त्वज्ञानात्) of the similar, dissimilar, general (सामान्य) specialized (विशेष) inherent (समवाय) (properties of) entities or substances, their qualities (or properties) and their different types of motion (द्रव्यगुणकर्म) pertaining to the fundamental entities or fundamental substances पदार्थ.

Moksha or liberation comes by enlightenment of 'tatva' - the nature of the reality and that nature of reality comprises of 'dhravya' - substances, 'guna' - their properties, 'karma'- their motions and 'samanya' - generalization, 'vishesha' -specialization and 'samavaya' - inherence of the behavior nature and the exact description of interaction of material substances born out of special qualities of dharma.

Dharma comprising of the laws of science, the laws of physics born out of the understanding, the tatvagyaana of dhravya, guna, karma, samaya, vishesha, and samavaya-'Shadpadarthas'. The Vaisesikasutras of Kanada have admitted or recognized sixPadarthas. These shadpadarthas have

been later extended into seven padarthas, 'abhava' or nothingness as one of the additional padarthas and further extended up to ten.

In this sutra, Kanada is indicating the outline of the exhaustive philosophical knowledge of the physical world in terms of its constituent Padarthas made of substances, their qualities or properties and their motions of various types, of the similar and dissimilar, generalized, and specialized (or general and particular) all this knowledge leading to the highest good all born out of the special qualities of Dharma. In other words, Kanada is describing the details of physics – physical entities their fundamental material constituents, their properties, and their motions of different kinds – knowledge of all of which is being stated to lead to the highest good.

Even Einstein or Newton or nobody said or understood that tatvagyana of physical world, understanding of physics will lead to liberation or moksha. The main reason is that they have not understood the existence of the self. Whereas, in Vaisheshika sutras, 'aatman' or self is accepted, recognized, and explained.

पृथिव्यापस्तेजो वायुराकाशं कालो दिगात्मा मन इति द्रव्याणि ॥ ५ ॥

पृथिवी = the element Prithivi, आपः = the element Apa, तेजः = the element Teja, वायुः = the element Vayu, आकाशम् = the element Akasa, दिग् = direction/space, काल = the Time, मन = the Mind, आत्मा = the Self these (above) are, द्रव्याणि = substances or fundamental elements of the Universe.

Prithivi, Apa, Teja, Vayu, Akasa, Direction / Space, Time, Mind and Self are the (nine) material entities or substances (of the physical world or Universe).

There are nine dravyas, Prithivi, Apa, Teja, Vayu, Akasa, Kala, Dig, Mana and Aatma.

The 'Panchabhootas' in Sankhya are 'Dravyas' in Vaisheshika. The main difference between Sankhya and Vaisheshika is - in Sankhya there is no acceptance or recognition of the real existence of external world except as it appears inside the mind through the five senses. So, those five senses have manifested themselves as Panchabhootas inside the mind. There is no recognition or acceptance of a substance outside the mind. Whereas, in Vaisheshika, there is acceptance of substance - dravya outside the mind. Added to the above mentioned five dravyas are the 'dig' - cartesian space is referential XYZ coordinates, 'aatma' – observer or self, 'mana' - mind and 'kala' – time.

Akasa is part of the panchabhootas, is called ether in English.

In Classical physics, Matter, Energy, Space and Time are considered. In addition, Vaisesika also considers Mana and Aatma, because the existence of the observer is recognized. Without observer there cannot be any observation of the existence of the physical world.

Whether physical world exists or not cannot be known unless and until the observer - self or aatman exists and it also has a mind or mana to operate. Because if there is no mind, aatman exists but there is no observation possible. (ex. In deep sleep). Hence, Mind and Self are also fundamental.

The existence of observer has been ignored in the Classical or Newtonian physics but in the Relativistic physics, the observer decides the definition of space and time. As per the special theory of relativity given by the equation,

$$E = m_0 c^2 / (1 - v^2/c^2)^{1/2}$$

where v is the velocity of the observer of the system in which the observer is traveling while making the observation, c is the speed of light.

If v = c then, space and time will become zero? and if v > c then it will become imaginary negative.

Dravyas are not just earth and air, this is a crude description. Vedas have described this as 'Devatas'. It could be interpreted as the generalized description. The word Devatas can be interpreted as subject or tatva. In Vedas, the word devata means a subject, not any person. Prithvi, Apa, Vayu are all subjects and those devatas have been described in the Vedas. Teja is described as the universal energy principle.

गर्भोऽस्योषधीनां गर्भो वनस्पतीनां गर्भो विश्वस्य भूतस्याग्ने गर्भोऽपामसि ।

Oh agni! you are inside the Apa and you are inside the Vishwa, the whole universe. The universal energy principle is called 'Agni' which is also interpreted as 'Prabrahman' sometimes in the Veda.

Prithvi, Apa, Vayu are the devatas whose physical manifestation can be partially interpreted as solid, liquid and gaseous states of matter.

Vibrations associated with the mantras - 'moola mantras' or the 'bijaksharas' associated with devatas are also described. For example, 'ya' is vayu bija, 'la' is prithvi bija, 'ra' is agni bija and 'va' is the apa or amrutha bija. The vibrations are the equivalent or extended forms of these dravyas and all put together is the 'adistana devata'. Hence, devata is just not any human being or person but the adistana devata is all different forms of force or subject and this is how the samanvaya between Veda and Vaisesika comes. Vaisesika never mentions the devata word but it talks about dravya, guna, karma which is the physical manifestation of those devatas in the veda.

**रूपरसगन्धस्पर्शाः सङ्ख्याः परिमाणानि पृथक्त्वं संयोगविभागौ
परत्वापरत्वे बुद्धयः सुखदुःखे इच्छाद्वेषौ प्रयत्नाश्च, गुणाः ॥ ६ ॥**

रूप = form/shape/colour, रस = taste, गन्ध = smell, स्पर्श = touch, संख्या = numbers and counting, परिमाणानि = various measures (length, area, volume, weight etc.), पृथक्त्वम् = being distinguished (to be separated), संयोग = conjunction or joining (or combination), विभाग = disjunction or disjoining (or division), परत्व = 'being next' (or spatially next or temporally later or subsequent), अपरत्व = 'being previous' (or spatially previous, or temporally previous or earlier), बुद्धयः = intellects (several), सुखम् = happiness, दुःखम् = sorrow, इच्छा = desire, द्वेष = hatred, च = and, प्रयत्नाः = efforts.

गुणाः these (17) are qualities or properties or attributes.

Form / Shape / Color, Taste, Smell, Touch, Numbers and counting, various Measures (length, area, volume, weight etc.), being distinguished (to be separated), conjunction or joining (or combination), disjunction or disjoining (or division), 'being next' (or spatially next or temporally later or subsequent), 'being previous' (or spatially previous, or temporally previous or earlier), intellects (several), happiness, sorrow, desire, hatred, and effort these (17) are qualities (or properties).

The first 11 above are the qualities of physical substances or entities. The last 6 are the qualities of the mind and self. The mind and self have also been considered as Dravyas or entities and they have qualities as mentioned above (the last 6 qualities). Prayatna (effort) is a quality of self while all the rest (5) are the qualities of mind.

उत्क्षेपणमवक्षेपणमाकुञ्चनं प्रसारणं गमनमिति कर्माणि ॥ ७ ॥

उत्क्षेपणम् = throwing up or upward motion/thrust, अवक्षेपणम् = throwing down or downward motion, आकुञ्चनम् = contracting or pulling towards a point, प्रसारणम् = spreading or transmission or broadcast, गमनम् = motion (in general), इति = these are, कर्माणि = Karmas or types of Motion.

Throwing up or upward motion or thrust, throwing down or downward motion, contracting or pulling towards a point, spreading or transmission or broadcast and motion (in general) - these are various types of Karmas or types of Motion.

In this sutra, various types of Karma (Motion) are explained. Karma or action, which can be interpreted as motion, can be classified into five categories: upward motion,

downward motion, contraction, expansion or spreading (also called broadcasting or transmission) and finally general motion. The definition of general motion is being distinguished from other four specific categories of motion viz., upward motion, downward motion, contraction and expansion (or transmission/ broadcasting). What does this mean? Logically motion is a generalized concept which can be modelled separately from specific categories of motion. This means that more categories

of motion are possible to be identified. Prasastapada has identified many more categories of motion as follows:

गमनग्रहणात् भ्रमणरेचनस्यन्दनोर्ध्वज्वलनतिर्यक्पतननमनोन्नमनादयः

गमनविशेषाः ।

While motion (गमनम्) can mean, in general, just about any type of motion, as defined in a given context. It thereby provides adequate flexibility to permit any type of motion, as a special case of general motion. Praśastapāda has identified on this basis, some well known additional categories of motion, which are universally observable and which are referred by Kaṇāda himself, in later sūtras of Vaiśeṣika: भ्रमण or circular motion, रेचन or gushing out or expulsion, स्पन्दन harmonic motion or beat (as in case of heart beat or हृदयस्पन्दन, ऊर्ध्वज्वलन upward burning (of flame), तिर्यक्पतन falling down, नमन bending forward, उन्नमन rising upward, आदयः etc., i.e. all other types of motion are गमनविशेषाः are special types of motion. He also stated न जात्यन्तराः not that these motions belong to a different class i.e. the motion such as rotation etc. mentioned above are only specialized categories of one single class of Karma viz गमन or motion in general

सदनित्यं द्रव्यवत्कार्यं कारणं सामान्यविशेषवदिति
द्रव्यगुणकर्मणामविशेषः ॥ ८ ॥

सत् = (having) Existence, अनित्यम् = (being) impermanent (temporary), द्रव्यवत्कार्यम् = (being) the result or Effect (of something which is a Cause), कारणम् = (being) the Cause (of something which is a result or effect), सामान्य = (being) generalized and, विशेषवत् = (being) specialized, इति = (all) these (above) are, अविशेषः = (all the properties) in general of, द्रव्य = (all) material entities or substances, गुण = (all) qualities or properties and, कर्मणाम् = (all) actions or motions.

Having existence, being impermanent (temporary), being the result or Effect (of something which is a Cause), being the Cause (of something which is a result or effect), being generalized and being specialized - all these above are the properties in general of material entities (or substances), qualities (or properties) and motions.

In this sutra, Kanada is describing the properties of all material entities or substances, qualities, or properties and motions. These general properties are:

having existence, being impermanent (temporary), being the cause, and being the effect, being generalized and being specialized (having class hierarchy).

Prasastapada adds two more qualities for definition, in addition to the above

अभिधेयत्व and ज्ञेयत्व i.e., naming (them), knowing (them) i.e. being identified with a name and also being known. Evidently any specific material entity or substance, its quality or motion should be identifiable and knowable.

Law of Conservation of Matter

न द्रव्यं कार्यं कारणञ्च वधति ॥ १२ ॥

न = no, द्रव्यम् = material entity (or substance), वधति = destroys (or kills) its own, कार्यम् = effect, च = and, कारणम् = cause.

No material entity (or substance) destroys (or kills) its own effect and cause.

In other words, material entity (or substance) is conserved. "This is law of conservation of matter." A substance cannot be the cause of its own destruction.

Some other cause should exist.

उभयथा गुणाः ॥ १३ ॥

गुणाः = qualities (or properties) are, उभयथाः = both ways.

Qualities (or properties) are both ways

But the qualities (or properties) can destroy the Cause and Effects of the qualities (or properties). While in the previous sutra the law of conservation of matter is stated, in this sutra it is stated that the same is not applicable for qualities (or properties). In other words the law of conservation does not apply to qualities (or properties) - it applies only to matter.

Impossibility of Perpetual Motion

कार्यविरोधि कर्म ॥ १४ ॥

कर्म = motion is, कार्यविरोधि = the enemy (or opponent) of motion.

Motion is the enemy (or opponent) of motion.

Motion is the enemy of its own effects of motion.

Motion destroys motion. In other words, motion will halt when it is executed i.e., after motion is completed, there is a complete halt i.e., the body will come to stand still. It is being stated here that any motion will come to an end i.e., perpetual motion is not possible. (This could be interpreted to be referring to knowledge of friction not permitting perpetual motion)

Properties of Substance

क्रियागुणवत् समवायिकारणमिति द्रव्यलक्षणम् ॥ १५ ॥

द्रव्यलक्षणम् = the characteristics of Dravya (material entity or substance) are to be, क्रियागुणवत् = having motion and having qualities, समवायिकारणम् = being the cause of (or with) inherence (of qualities and motions), इति = these (above)

The characteristics of Dravya (material entity or substance) are to be having motion and having qualities and being the cause of inherence (of qualities and motions). (or being a cause withinherent and motions qualities).

Properties of substance are being defined here. A substance has a basic characteristic of inherence of motion and qualities. A substance has an inherent characteristic of having some qualities and having some motions.

Inherence Relation is a relation in Logic where a certain substance has certain inherent characteristics, such as qualities as heat and motions such as rotary motion. The characteristics of any general substance are to have (i) motion and (ii) qualities. This is possible only due to 'Inherence' relation. Therefore, Inherence is very important.

Properties of Motion

**एकद्रव्यमगुणं संयोगविभागेष्वनपेक्षकारणमिति
कर्मलक्षणम् ॥ १७ ॥**

कर्मलक्षणम् = the characteristics of motion are - एकद्रव्यम् = to be belonging to only one material entity (or substance), अगुणम् = having no quality, अनपेक्षकारणम् = being the unaffected cause, संयोगविभागेषु = (both) in conjunction and disjunction, इति = these (above).

The characteristics of motion are - to be belonging to only one material entity (or substance), having no quality, being unaffected cause (both) in conjunction and disjunction.

The characteristics of motion are - (i) being dependent or pertinent to one single material entity (or substance) (ii) not having any quality and (iii) being an unaffected cause in conjunction and disjunction (as cause precedes effects).

Motion has to be associated with a single substance.

Motion has no qualities. Motion can be the Cause in a conjunctive or disjunctive interaction (or transaction) between several material entities (or substances).

द्रव्यगुणकर्मणां द्रव्यं कारणं सामान्यम् ॥ १८ ॥

द्रव्यं कारणम् = material entity (or substance) is the (common) cause of, द्रव्यगुणकर्मणाम् = (all the three) material entity (or substance), quality and motion, सामान्यम् = in general.

In general a material entity (or substance) is the cause of (all the three) material entity (or substance), quality and motion.

As a generalization, it is being stated that a material entity (or substance) is the general (common) cause of any material entity (or substance), its qualities and its motions.

तथा गुणः ॥ १९ ॥

तथा = similarly, गुणः = quality (also).

Similarly quality (also).

Similarly quality also is the Cause (to the three).

संयोगविभागवेगानां कर्म समानम् ॥ २० ॥

कर्म = motion, समानम् = is common (cause of), संयोगविभाग-वेगानाम् = conjunction, disjunction and speed.

Motion is the common cause for any conjunction (joining of substances together), disjunction (dividing any one substance into many) and speed (or impetus).

न द्रव्याणां कर्म ॥ २१ ॥

न कर्म = (but) not motion (is the cause), द्रव्याणाम् = of material entities (or substances).

But not motion (is the cause) of material entities (or substances).

Evidently, motion cannot be the cause of substances or their qualities (simply motion cannot produce a new material entity (or substance) or its qualities)

व्यतिरेकात् ॥ २२ ॥

व्यतिरेकात् = Due to being opposed.

By virtue of motion being the very opposite of substance, motion cannot be the cause of substance. Also, all motions will come to an end and therefore cannot be the causes for substances or their qualities.

Causality Principle

कारणाभावात्कार्याभावः ॥ १ ॥

कार्याभावः = the absence of the Effect is, कारणाभावात् = due to the absence of the Cause.

The absence of the effect is due to the absence of the cause.

There can be no effect if there is no cause. This is the fundamental principle of Causality. This sutra is enunciating the causality principle, which states that for every effect there must be a cause, existent, without fail. There cannot be any effect without a cause for it. This causality principle is the bed rock of rationality. The whole of science is based on the causality principle. Therefore, Vaisheshika can be declared as a Science, with the foundations on causality principle. Also, Vaisheshika can be stated to be a rationalist school of thought.

न तु कार्याभावात् कारणाभावः ॥ २ ॥

तु = but, न = not that, कारणाभावः = the Cause is absent, कार्याभावात् = due to the absence of the effect.

But not that the Cause is absent due to the absence of the effect.

The absence of the effect does not mean the absence of the Cause. The cause can exist without any effects. While there cannot be any effect without a cause for it, there can be a cause which has no effects. In Artificial Intelligence (AI) this is very important.

Generalization and Specialization

सामान्यं विशेष इति बुद्ध्यपेक्षम् ॥ ३ ॥

सामान्यम् = this is 'general', विशेषः = this is 'special', इति = these above are, बुद्ध्यपेक्षम् = perceived by the intellect.

This is 'general'; this is 'special' - these are perceived by the intellect.

Generalization and Specialization are perceived by the intellect. Class hierarchy defines generalization and specialization. Evidently the class definition is possible through the intellectual grasp or inference of the intellect.

Therefore, generalization and specialization are the inferences of the intellect.

Existence as Generalization

भावोऽनुवृत्तेरेव हेतुत्वात् सामान्यमेव ॥ ४ ॥

भावः = (the notion of) existence is, एव = only, सामान्यम् = a generalization, अनुवृत्तेः = the grasp of intellect, एव = only, हेतुत्वात् = being the cause.

The notion of existence is only a generalization - the grasp of intellect being the cause.

Grasp by the intellect being the cause, the notion of existence is only a perception of generalization. The notion of existence is for all the three material entities (or substances), their qualities and their motions. The generalization abstraction is possible for all these three due to the intellect being able to grasp their existence. In other words, by the grasp of intellect a generalized perception or view of 'existence' is possible for all the three: material entities (or substances), their qualities, and their motions.

'Existence' is the super class or Universal class of all classes (of material entities (or substances) qualities and motion).

Class Hierarchy of Generalization and Specialization

अन्यत्रान्त्येभ्यो विशेषेभ्यः ॥ ६ ॥

अन्त्येभ्यो विशेषेभ्यः = (excepting) the specialization instances at the end (of the class hierarchy), अन्यत्र = among all others (are part of the generalization and specialization).

Excepting the specialization instances at the end (of the class hierarchy) all others (are part of the generalization and specialization).

In the class hierarchy tree (therefore) the leaf nodes i.e., ending instances are to be exempted for considering the hierarchy. The last entries in the tree of hierarchy (comprising of generalization and specialization) i.e., the object instances must be left out and at all other levels of the tree the perception of generalization and specialization is applicable.

Evidently, the last level of the tree or hierarchy will be the instantiation where no class - subclass hierarchy can exist.

At all other levels above the bottom most level, the hierarchy of the generalization and specialization exists for all the three (dravya, guna, karma).

The root node and the last ending nodes (instances or leaf nodes) will not have any hierarchy in a tree. This sutra demonstrates the full knowledge of generalization

and specialization hierarchy tree structure as applied to all material entities (or substances), qualities, and motions.

One Existence

सदिति लिङ्गविशेषाद् विशेषलिङ्गभावाच्चैको भावः ॥ १७ ॥

सत् = the notion or perception of 'Existence' exists, इति = also, एको भावः = as one existence, लिङ्गविशेषात् = due to itself being a special indicator, विशेषलिङ्गभावाच्च = due to the absence of any special indicator.

The notion or perception of 'existence' exists, also as one existence, due to itself being a special indicator, due to the absence of any special indicator.

'Existence' exists independently as 'One' due to it not being varying and also not being differentiable. Existence or exists on its own, independent of everything.

The notion of Existence in Vaisheshika is equivalent to notion of Brahman in Vedanta.

रूपरसगन्धस्पर्शवती पृथिवी ॥ १ ॥

पृथिवी = The element (or substance) Prithivi (has the qualities of), रूप = form/shape/colour, रस = taste, गन्ध = smell, स्पर्शवती = (having) touch.

The element (or substance) Prithivi has the qualities of form/ shape/ colour, taste, smell and touch.

Prithivi, the first of the material entities (or substances) has the qualities of form/shape/colour, taste, smell, and touch. We can see that all these qualities are

nothing but the physical properties which exist for any material element (or substance).

रूपरसस्पर्शवत्य आपो द्रवाः स्निग्धाः ॥ २ ॥

आपः = Apa are, द्रवाः = liquids, रूपरसस्पर्शवत्यः = having the properties of forms/ shape/ colour, taste and touch (ability), स्निग्धाः = are viscid (oily/soft).

'Apa' are liquids having the properties of forms / shape/ colour, taste and touch (ability) are viscid (oily/ soft)

We can state that Apa refers to the abstract notion which is liquid and having the properties of forms/ shape/colour, taste, and touch (ability). It is clear that the quality of smell is dropped in Apa when compared to the qualities of Prthivi.

तेजो रूपस्पर्शवत् ॥ ३ ॥

तेजः = Teja, रूपस्पर्शवत् = has forms/shapes/colour and touch (ability).

Teja has forms / shapes / colour and touch (ability).

The material entity (or substance) Teja has colour and touch (ability). Teja is an abstract substance (or material entity) which may be equated with the Energy Principle in Modern Science. Traditionally Teja was equated with Light, Agni or Fire. etc. Agni was identified in the Vedas as the Universal Energy Principle which has multifarious forms such as Light, Fire (heat/ flame) (which could be 'digestive

fire' etc.) - all referring to the generalized principle of Energy.

स्पर्शवान् वायुः ॥ ४ ॥

वायुः = Vayu, स्पर्शवान् = has the quality of touch (ability).

Vayu has the quality of touch (ability).

The material element (or substance) Vayu has the quality of touch (only). All other qualities such as form/ shape/colour, sound, taste, smell are not present in Vayu. Vayu can be taken as the gaseous state of matter, in practical physical terms, even though Vayu is much beyond that. Vayu is not just gaseous state alone the scope of its definition goes much beyond. Prasastapada elaborates the qualities of

Vāyu to be touch (ability), counting (संख्या) measure (volume or weight) (परिमाण) differentiability (पृथक्त्व) conjunction (संयोग) disjunction or division (विभाग) being next (परत्व) being previous (आगत्य) and being next (संयोग)

The sensory organ skin (for touch) is identified to be associated with Vayu

त आकाशे न विद्यन्ते ॥ ५ ॥

ते = they (all the qualities), न विद्यन्ते = do not exist, आकाशे = in Akasa.

They (all the qualities) do not exist in Akasa.

In the material entity (or substance) Ākāśa all the qualities (such as forms/shape/colour, smell, taste, touch etc.) do not exist. But other qualities such as sound (शब्द) counting (संख्या) measure (परिमाण) differentiability (पृथक्त्व) conjunction (संयोग) disjunction (विभाग) do exist in Ākāśa.

**सर्पिर्जतुमधूच्छिष्टानामग्निसंयोगात्
द्रवत्वमदिभः सामान्यम् ॥ ६ ॥**

द्रवत्वम् = liquidity is, सामान्यम् = is a common quality, अदिभः = for liquids (Apa) and also for, सर्पिः = ghee or clarified butter, जतु = lac, मधूच्छिष्टानां = bee wax or honey comb wax, अग्निसंयोगात् = due to contact or conjunction with Agni.

Liquidity is a common quality for liquids (Apa) and also for ghee (or clarified butter), lac, bee wax (or honey-comb wax) due to the contact or conjunction with Agni.

Upon the contact or conjunction with Agni or heat i.e., due to melting of solids as ghee, lac and bee wax acquire - liquidity as a common property of Apa. When some solids such as ghee, lac, bee wax are exposed to heat they melt to become liquids - thus liquidity is shown to be a common property for such solids and normal liquids (such as water, oil etc.). Hence, we can see

here some understanding of change of state of matter from solid to liquid due to the application of heat (change of state from liquid to gaseous state is not mentioned here).

त्रपुसीसलोहरजतसुवर्णानामग्निसंयोगात्

द्रवत्वमद्भिः सामान्यम् ॥ ७ ॥

द्रवत्वम् = liquidity is, सामान्यम् = common property, अद्भिः = for liquids and also for, त्रपु = tin, सीस = lead, लोह = iron, रजत = silver, सुवर्णानाम् = gold, अग्निसंयोगात् = due to contact with Agni.

Liquidity is common property for liquids and also for tin, lead, iron, silver and gold due to their contact with Agni.

Due to the contact with Agni or heat, metals such as tin, lead, iron, silver and gold also acquire liquidity (quality) i.e., liquid state, similar to all other liquids (Apa). In this sutra the change of state from solid to liquid is further elaborated for metallic objects (while in the previous sutra non-metallic objects are described as to be melting upon application of heat).

प्रसिद्धा इन्द्रियार्थाः ॥ १ ॥

इन्द्रियार्थाः = the objects of senses (or the objects and the senses), प्रसिद्धाः = are well known.

The objects of senses (or the objects and the senses) are well known.

The objects of senses are well known.

The five intelligent senses have their corresponding objects. The eyes have the ability of sight which is indicated by the form/shape/colour. The ears have the ability to hear which is indicated by Sabda, a sound or any kind of vibration. The tongue has the ability of taste (through the taste buds) which is indicated by Rasa.

The nose has the ability of smell. The skin has the ability of touch. As indicated earlier, the first five of the nine dravyas are substances namely Prthivi, Apa, Vayu, Akasa and Teja are respectively indicated or observed by the senses as smell, taste, touch, sound and sight.

कारणाऽज्ञानात् ॥ ४ ॥

अज्ञानात् = due to the lack of knowledge of, कारण = the cause(s) (of the sensory perception).

Due to the lack of knowledge of the Cause(s) (of the sensory perception)

The simple sensory perception of the real world lacks the knowledge of the cause(s) of such perception. The simple perception of the senses cannot be adequately sufficient to identify the cause-and-effect relationship which is essential for any deeper or more accurate perception or knowledge of the real world. The knowledge of the real world is based upon the inference of the cause(s) which create their effects

which are actually perceived by the senses. The sensory perception cannot perceive the cause(s). The knowledge so gained is therefore incomplete.

कार्येषु ज्ञानात् ॥ ५ ॥

ज्ञानात् = knowledge is (only), कार्येषु = in the effects.

Knowledge is only in the effects.

The knowledge acquired by sensory perception is limited to the effects (and not the causes of those effects), as those causes cannot be observed by the senses. Those

causes can be only inferred, based on these sensory observations with due analysis and inferences to identify them.

अज्ञानाच्च ॥ ६ ॥

च = also, अज्ञानात् = due to ignorance.

Also due to ignorance.

The lack of knowledge is also due to ignorance. The sensory objects are based on ignorance. The sensory observation of an object by itself does not carry or contain any knowledge in it.

संयोगि समवाय्येकार्थसमवायि विरोधि च ॥ ९ ॥

संयोगि = one which has the conjunction (relationship), समवायि = one which has the inherence (relationship), एकार्थसमवायि = one in which has the inherence (relationship) existing in one meaning only and any other relationship in any other meanings - the singular inherent. विरोधि = the opposite or the contradiction. च = also.

The conjunct, the inherent, the singular inherent, the contradict, are all various forms of indications of inference.

The relationships can be of various categories or types:

the conjunct, the inherent, the singular inherent, the contradiction or opponent. Any two entities or objects can be related to each other in any of these forms of relationships.

कार्यं कार्यान्तरस्य ॥ १० ॥

कार्यम् = the effect, कार्यान्तरस्य = alternate effect.

The effect and alternate effect.

A cause can have not only one effect, but can have alternate effects also.

भूतमभूतस्य ॥ १२ ॥

अभूतस्य = of that which had not taken place is an indication of, भूतम् = that which has taken place.

Of that which had not taken place is an indication that which has taken place.

In the same logic as above some event which had not taken place can be the indication of the opposite i.e., the event having taken place.

प्रसिद्धिपूर्वकत्वादपदेशस्य ॥ १४ ॥

प्रसिद्धिपूर्वकत्वात् = due to being a well-known precedent,

अपदेशस्य = of the inference.

Due to being a well-known precedent of the inference.

The above mentioned are valid indications because the indicative characteristics of an inferential mark or indication is that it is preceded by the recollection of the Universal relation of itself and that of which it is an indication.

अप्रसिद्धोऽनपदेशोऽसन् सन्दिग्धश्चानपदेशः ॥ १५ ॥

अप्रसिद्धः = not well-known, not universal, not known or not proven, अनपदेशः = that which cannot be inferred, सन्दिग्धः = ambiguous or doubtful, च = and (all above), असन् = are/ were, अनपदेशः = cannot be inferred - are all false indications.

Not well-known, not universal, not known or proven, that which cannot be inferred, ambiguous or doubtful and (all above) are/ were cannot be inferred. Are all false indications.

Inference is not possible in all the three cases: a) unknown (unproven); b) ambiguous or doubtful; c) cannot be inferred.

**अहमिति मुख्ययोग्याभ्यां शब्दवद्व्यतिरेकाव्यभिचारा-
द्विशेषसिद्धेर्नागमिकः ॥ १८ ॥**

अहमिति = the knowledge 'I am', मुख्ययोग्याभ्याम् = along with important attributes, नागमिकः = is not (necessarily or only) revealed by the Vedas, व्यतिरेकाव्यभिचारात् = due to invariable divergence, विशेषसिद्धेः = proved in particular, शब्दवत् = similar to Sabda.

The knowledge 'I am' (alongwith important attributes) is not (necessarily or only) revealed by the Vedas, due to the invariable divergence proved in particular. similar to Sabda.

The existence of the self is not proved only by therevelation by the Vedas. Since the self is proved in particularby the innate as well as sensible cognition in the form

of 'I' accompanied by the invariable divergence of suchcognition from all other things in the world (as in the caseof Sabda).

Just as the quality Sabda is present only in Akasa andnot in other entities, so also the feelings of 'I' (am happyetc.) cannot be found in the body. This feeling of 'I amhappy' just as Sabda in Akasa) should be present in adifferent entity i.e., self.

Thus, self has to exist, independent of the body.

Atomic Theory

सदकारणवन्नित्यम् ॥ ११ ॥

सत् = Existence (the essence of material existence), अकारणवत् = which has no cause or is causeless i.e. born or exists on its own, without a cause, नित्यम् = is eternal or permanent.

Existence (the essence of material existence) which has no cause or causeless i.e. born or exists on its own, without a Cause and is eternal or permanent.

Sat or Existence is eternal, and it is causeless.

As eternal existence has no cause to create it, it is always there i.e., permanent

This notion of Existence appears to be identical to the notion of Brahman in Vedanta.

Sat is the first of the three: Sat, Cit, Ananda.

Sat is Pure Existence or Absolute Existence, the essence of all material reality.

This is the same as the Absolute (material) Reality in Physics, which has two facets: Matter and Energy.

The Brahman of Vedanta is same as the Sat of Vaisheshika, is the same entity which is Absolute Reality of Physics, whose two facets are Matter and Energy in Relativistic Physics.

Clearly Sat is eternal and is causeless.

Objections

अनित्य इति विशेषतः प्रतिषेधभावः ॥ ४ ॥

अनित्यः = non eternal, non permanent or temporary, इति = this (as above), प्रतिषेधभावः = (is) a contradiction, विशेषतः = of the particular or specialized.

Non eternal, non permanent or temporary - this is a contradiction of the particular or specialized.

Such expressions as 'non eternal' can be explained as negation or the denial of the particular or specialized (Visesa).

'Non eternal' - such intuition" or statement can be accounted for, only as a negation of the eternal i.e., the atomic units. This sutra establishes the eternity of the atoms. The concept behind using the word 'non eternal' is that the denial of the produced objects is not negated. Therefore, it follows that there are objects which are meant for the denial of the produced objects - those objects are the atoms.

Motion

आत्मसंयोगप्रयत्नाभ्यां हस्ते कर्म ॥ १ ॥

कर्म = motion, हस्ते = in hand, आत्मसंयोगप्रयत्नाभ्याम् = due to the conjunction of the self and the effort.

Motion in hand (is produced) due to the conjunction of the self and the effort.

Motion in hand is possible due the conjunction of the self and the effort. (Effort is a quality). When there is an effort in the self, it is reflected as motion in the hand,

then the hand is moved. The effort has originated in the self, due to a desire of the self to move the hand. Unless there is an effort originating in the self, there cannot be any motion in the hand.

तथा हस्तसंयोगाच्च मुसले कर्म ॥ २ ॥

तथा च = in the same way also, हस्तसंयोगात् = due to the conjunction of the hand (with stone), कर्म = motion (is generated), मुसले = in stone (or pestle).

In the same way also, due to the conjunction of the hand (with stone) motion (is generated) in stone (or pestle).

Now a discussion is being presented where the hand is getting in contact with a stone (or pestle). When the hand is in motion and then during motion it gets in contact with a stone, then there is motion caused in the stone. Such a motion in the stone is caused due to the impact and contact of the hand with the stone.

अभिघातजे मुसलादौ कर्मणि

व्यतिरेकादकारणं हस्तसंयोगः ॥ ३ ॥

अभिघातजे कर्मणि = in the motion born out of the impact, मुसलादौ = among stone and other objects, हस्तसंयोगः = conjunction of hand, अकारणम् = is not a cause, व्यतिरेकात् = due to the absence (of volition).

In the motion born out of the impact among the stone and the other objects conjunction of hand is not a cause due to the absence (of volition).

In the motion produced in the stone etc. by impact, conjunction with the hand alone cannot be the cause, due to the absence of volition (with in hand). Impact has to be

there to cause motion in the stone (or pestle).

तथात्मसंयोगो हस्तकर्मणि ॥ ४ ॥

तथा = similarly, आत्मसंयोगः = the conjunction with the self (of effort), हस्तकर्मणि = in the motion in the hand.

Similarly the conjunction with the self (of effort) in the motion in the hand.

In the case of motion in the hand the conjunction with the self is not the cause, similarly.

अभिघातान्मुसलसंयोगाद्धस्ते कर्म ॥ ५ ॥

अभिघातात् = due to impact, मुसलसंयोगात् = caused due to the conjunction (of the hand) with the stone, कर्म = motion, हस्ते = in hand (is caused).

Due to the impact caused due to the conjunction (of the hand) with the stone, motion in hand (is caused).

Even though there is motion caused in the stone due to the impact of hand on the stone, it is being stated here that there is a motion caused in the hand also, due to its

impact with the stone. This clearly is a reference to the reaction on hand (similar to recoil of a gun when fired).

For every action, there is an (equal and) opposite reaction - this is being stated in this sutra.

The indication of the third law of motion of Newton can be inferred from this sutra.

आत्मकर्म हस्तसंयोगाच्च ॥ ६ ॥

च = also, आत्मकर्म = self motion, हस्तसंयोगात् = due to the conjunction with the hand.

Also self motion due to the conjunction with the hand

In similar lines of reaction, motion in the self (including the body) is also caused due to the conjunction with the hand. Just as motion in the stone has also caused motion

in the hand as a reaction, motion in hand also causes motion in the self (in the body).

संयोगाभावे गुरुत्वात् पतनम् ॥ ७ ॥

पतनम् = fall (happens), गुरुत्वात् = due to Gurutwa (or heaviness), संयोगाभावे = in the absence of conjunction (with any other object).

Fall happens due to Gurutwa (or heaviness) in the absence of the conjunction (with any other object).

In this sutra, the role of Gurutva (or heaviness) is being described in causing the fall of any object, if it is not in conjunction or contact with any other object.

It is being stated here that there shall be a fall of an object due to Gurutva, if such a fall is not prevented by any other object by its conjunction with the original object.

This sutra indicates the knowledge of Gurutva and its effect on objects causing their fall (unless prevented by the contact with other objects).

नोदनविशेषाभावान्नोर्ध्वं न तिर्यग्गमनम् ॥ ८ ॥

नोदनविशेषाभावात् = in the absence of a special force, गमनम् = motion (in general), न = is possible neither, ऊर्ध्वम् = upwards, न = nor, तिर्यक् = downwards.

In the absence of a special force the motion (in general) is possible neither upwards nor downwards. (Without a special force, motion (upwards or downwards) is not possible).

Without the existence of a special force, neither upward motion nor downward motion (i.e. fall) is possible.

By stating so, the author is clearly implying that there has to be a special force existing to cause downward motion or fall. Since he has referred to Gurutva as the cause of the fall, in the absence of a contact to prevent it, we can safely conclude that he is identifying Gurutva as a special force (by combining the meaning of

both the present and previous sutras).

प्रयत्नविशेषान्नोदनविशेषः ॥ ९ ॥

नोदनविशेषः = special force, प्रयत्नविशेषात् = (is caused) due to the special effort.

Special force (is caused) due to the special effort.

A higher force can be caused by a higher effort.

नोदनविशेषादुदसनविशेषः ॥ १० ॥

उदसनविशेषः = special speed or velocity (extra velocity or acceleration), नोदनविशेषात् = due to special force (extra force or higher force).

Special speed or velocity (extra velocity or acceleration (is caused) due to special force (extra force or higher force).

In this sutra the author is stating his knowledge of force and acceleration.

Special force or greater force causes special speed or greater speed/velocity - acceleration. In other words, acceleration is directly proportional to force.

Since greater force causes greater acceleration, it is directly proportional and can be expressed as follows:

f \propto a.

Force is directly proportional to acceleration.

Thus, we see that the author was familiar with laws of motion. We have shown one law of motion in this sutra, and we have shown another (third) law of motion in the

previous sutras. The author was familiar with force and its necessity to cause acceleration or greater speed/velocity, including downward motion or freefall due to gurutva.

He was also aware of a force causing the fall. Since he was aware of acceleration caused by a force, in the context of a free fall we can conclude that he was aware of a force behind gurutva which causes acceleration during the freefall i.e., acceleration due to gurutva.

We can finally conclude that the Author was familiar with

- (a) Gurutva which causes freefall (unless prevented),
- (b) a force which causes a freefall (unless prevented),
- (c) acceleration caused due to a force.

Summing up all the three we can state that acceleration due to a force causing

freefall due to gurutva was known (the morphological similarity and the possible etymological link between the word - Gurutva in Sanskrit and the word - Gravity in English, through its Greek origin cannot be ignored given the relationship of Greek with Sanskrit).

Broadly the Author was aware of the laws of motion.

However, it is to be noted that this awareness as expressed here is qualitative. Quantitative treatment is not available here, there may be other texts where quantitative treatment could have been made available (we can see such texts

at later periods).

Variety of Motions

Explosive Motion

तथा दग्धस्य विस्फोटने ॥ १२॥

तथा = similarly, विस्फोटने = explosion (explosive motion),
दग्धस्य = of the burnt object.

Similarly explosion (explosive motion) of the burnt object.

Similarly, an explosion can happen without a force causing it, due to the explosive nature of the ignited item (mixture). When an explosive is ignited, it will explode,

displaying explosive motion.

Vibratory Motion in Grass blades

तृणे कर्म वायुसंयोगात् ॥ १४ ॥

तृणे कर्म = (vibratory) motion in grass blades, वायुसंयोगात् = is due to conjunction with Vayu (air or breeze).

(Vibratory) motion in grass blades is due to conjunction with Vayu (air or breeze).

The vibratory motion in grass blade is due to their contact with Vāyu (air or breeze).

Crystal Motion and Motion of the Magnetic Needle

मणिगमनं सूच्यभिसर्पणमित्यदृष्टकारणकम् ॥ १५ ॥

मणिगमनम् = motion in crystals (quartz crystals, piezoelectric vibrations), सूची = (magnetic) needle, अभिसर्पणम् = deflection or vibratory motion, इति = these above, अदृष्टकारणकम् = caused by an invisible force.

Motion in crystals, (magnetic) needle deflection or vibratory motion - these above caused by an invisible force.

The motion of a crystal (such as quartz crystal) and deflection or vibratory -motion of a magnetic needle – these are all caused by a force which is invisible. Here the author is referring to the motions caused by the forces which are invisible. He recognized that there has to exist a force to cause these types of motions and since that force is invisible, he is stating the same as invisible.

Ballistic Motion of an Arrow released from a Bow

इषावयुगपत्संयोगविशेषाः कर्मान्यत्वे हेतुः ॥ १६ ॥

**इषौ = in the bow, अयुगपत् = gradually released (arrow), संयोग-
विशेषाः = with special conjunction, हेतुः = the cause, कर्मान्यत्वे = of
different motion.**

**In the bow gradually released (arrow) with special conjun-
tion is the cause of different motion**

The release is gradual (not sudden) with special conjunction with the bow. The motion of the arrow will be different due to that slow release with special

Conjunction

**नोदनादाद्यमिषोः कर्म तत्कर्मकारिताञ्च संस्कारादुत्तरं
तथोत्तरमुत्तरञ्च ॥ १७ ॥**

**इषोः = of the arrow, आद्यं कर्म = the initial motion, नोदनात् =
due to the force (of the bow on the arrow), च = and, तत् = that,
कर्मकारितात् = having performed the motion, संस्कारात् = due to
samskara (habit) of motion, उत्तरं कर्म = further motion, तथोत्तरमुत्तरञ्च =
and further motion and so on.**

Of the arrow, the initial motion due to the force (of the bow on the arrow) and that having performed, the motion due to samskara (habit) of motion, further motion and further motion and so on.

The initial motion of the arrow is due to the force of the bow on the arrow. That initial motion, when performed, causes Samskara of motion. We can interpret this as a tendency or trend or habit of motion.

This results in further motion and further motion and so on. In modern times we call this 'Kinetic Energy'.

संस्काराभावे गुरुत्वात् पतनम् ॥ १८ ॥

**पतनम् = free fall, गुरुत्वात् = due to Gurutva (happens),
संस्काराभावे = in the absence of the trait or tendency (of motion).**

**Free fall due to gurutva (happens) in the absence of the
trait or tendency (of motion).**

Upon the cessation of Samskara or trait or tendency of motion, the arrow shall suffer a free fall due to gurutva.

We can interpret Samskara of motion as equivalent to kinetic energy.

During the next motion of the arrow (due to kinetic energy generated due to the motion starting with the initial motion) and continuing until the kinetic energy is exhausted, in which case the arrow will suffer a free fall.

Motion in Solids

नोदनाभिघातात् संयुक्तसंयोगाच्च पृथिव्यां कर्म ॥ १९ ॥

**कर्म = motion (will happen), पृथिव्याम् = in Prithivi (solids),
नोदनाभिघातात् = due to the impact of a force, च = and also, संयुक्त-
संयोगात् = due to the conjunction of the combination (mixture).**

**Motion (will happen) in Prithivi (solids) due to the impact of
a force and also due to the conjunction of the combination
(mixture).**

Motion in solids can happen due to

(a) impact of a force and

(b) combination (mixture such as gun powder or any explosive mixture).

तद्विशेषेणादृष्टकारितम् ॥ २ ॥

तद्विशेषेण = the various varieties of motion, अदृष्टकारितम् = are caused by unseen or invisible (forces).

The various (other) varieties of motion are caused by unseen or invisible (forces)

Various other forms of motion such as earthquake etc., are all caused by the unseen or invisible forces. Other forms include motion of magnetic needle or crystal, etc.

Liquid State Properties

अपां संयोगाभावे गुरुत्वात् पतनम् ॥ ३ ॥

अपाम् = among Apa or liquids, पतनम् = fall (free fall) takes place, गुरुत्वात् = due to Gurutva, संयोगाभावे = in the absence of any kind of contact or conjunction with any other object.

Among Apa or liquids, fall (free fall) takes place due to Gurutva in the absence of any kind of contact or conjunction with any other object.

As in the case of the solids (discussed previously), free fall due to gravity will take place among liquids also, unless there is an object which shall prevent such a fall

due to its contact or conjunction with the liquid under fall.

द्रवत्वात् स्यन्दनम् ॥ ४ ॥

द्रवत्वात् = due to liquidity, स्यन्दनम् = viscous flow will take place (among liquids).

Due to liquidity, viscous flow will take place (among liquids).

The viscous flow of liquids is due to their liquidity.

Evaporation

नाड्यो वायुसंयोगादारोहणम् ॥ ५ ॥

आरोहणम् = evaporation (takes place), due to (the exposure to) sunlight (नाडी - Sun ray), नाड्यः = Sun ray, वायुसंयोगात् = due to contact with Vayu (breeze, air, gas).

Evaporation (takes place) due to (exposure to) sunlight and due to contact with Vayu (breeze, air, gas).

Evaporation takes place (in liquids) due to either exposure to sunlight or due to contact with Vayu (air, breeze, gas).

नोदनापीडनात् संयुक्तसंयोगाच्च ॥ ६ ॥

च = and also (evaporation takes place), (अपीडनात् = due to removal or absence of pressure,) नोदनापीडनात् = due to force or due to (removal or) absence of pressure, च संयुक्तसंयोगात् = also due to conjunction or contact with a mixture.

And also (evaporation takes place) due to the (removal or) absence of pressure, due to a force and also due to the conjunction or contact with a mixture.

In addition to exposure to sunlight and contact with Vayu, the phenomenon of evaporation can take place due to lessening or removing (or absence) of pressure (eg. atmospheric pressure), or due to the application of a force or due to a mixture of (explosive) materials.

In this sutra we can clearly see the hints of Boyle's Law (i.e., $PV = \text{constant}$).

वृक्षाभिसर्पणमित्यदृष्टकारितम् ॥ ७ ॥

वृक्षाभिसर्पणम् = the creeping motion of liquids inside the tree trunk, इति = this is, अदृष्टकारितम् = caused by an unseen or invisible force.

The creeping motion of liquids inside the tree trunk, this is caused by an unseen or invisible force.

The creeping motion of liquids inside the tree trunk, this is caused by an unseen or invisible force.

Here the author is describing capillary motion or osmosis (upward motion of liquids in tree trunks against gravity).

Condensation or Decomposition

अपां सङ्घातो विलयनञ्च तेजस्संयोगात् ॥ ८ ॥

अपाम् = among Apa (or liquids), सङ्घातः = coming together, condensation or synthesis, च विलयनम् = and also dissolution or decomposition (is caused), तेजस्संयोगात् = due to the conjunction or contact with Teja (energy).

Among Apa (or liquids) coming together, condensation or synthesis and also dissolution or decomposition (is caused) due to the conjunction or contact with Teja (energy).

This is a very profound sutra where the role of Energy principle i.e., Teja or Agni is being presented to be the cause of the synthesis or condensation or formation of liquids as water and their decomposition or dissolution. In modern times we know water gets formed due to the

condensation of water vapor which gets created by the conjunction or synthesis between hydrogen and oxygen.

The converse i.e., decomposition of water can also take place.

In both the cases the cause is electrical energy, which is a form of Energy Principle, Teja or Agni.

Electric Discharge

तत्र विस्फूर्जथुर्लिङ्गम् ॥ ९ ॥

तत्र = there in, लिङ्गम् = the proof or indicative characteristic (for the previous Sutra) is, विस्फूर्जथुः = the lightning or thunder (in the clouds).

There in the proof or indicative characteristic (for the previous Sutra) is the lightning or thunder (in the clouds).

The formation of water in the clouds due to thunder with electrical discharge is being discussed here. This shows the familiarity of the author with electrical energy and the cause of formation of water vapor and its condensation into water.

(Benjamin Franklin is usually credited with the discovery of electricity. Here we find that the author is familiar with the electricity, several thousand years before Benjamin Franklin).

वैदिकञ्च ॥ १० ॥

च = and also, वैदिकम् = (it is) from the Veda.

And also (it is) from the Veda.

The author is referring to the Veda as a source of the proof or indicative characteristic of electrical discharge being the cause of formation of water.

गर्भोऽस्योषधीनां गर्भो वनस्पतीनां गर्भो विश्वस्य भूतस्य अग्ने! गर्भो
अपामसि ।

'Oh Agni, you are present as the womb of plants, trees, the Elements, the Universe and the liquids.'

In this Mantra from the Veda the Universal Energy Principle - Agni is being described to be present in all plants, trees, the Elements, and the Universe in addition to the liquids.

The synthesis and decomposition of liquids as water takes place due to Agni, the Energy Principle. Energy principle is described as the womb of everything in the Universe.

अपां संयोगाद्विभागाच्च स्तनयित्नाः ॥ ११ ॥

अपाम् = of liquids, संयोगाद्विभागाच्च = due to the conjunction or synthesis and disjunction or decomposition, स्तनयित्नाः = due to thunder (or electric discharge) in the clouds.

Of liquids, the conjunction or synthesis and disjunction or decomposition takes place due to the thunder (or electric discharge) in the clouds.

Reference: The Physics of Vaisesika by Dr. C.S.R. Prabhu - ISBN: 978-93-81887-26-4

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