10 Nyaya and Vaisesika

10.1 Nyaya

Nyāya is one of the six orthodox systems of Indian philosophy. These systems are called *darśanas*, in Sanskrit. The Nyāya system is a philosophy of logic. It is also a system of epistemology. Though it was first formally written down by Gotama in the third century B.C., its history extends over twenty centuries as the original writings were expanded upon by subsequent writers and commentators. Most notable are the contributions of Udayana in the 10th century C.E., who wrote a treatise entitled *Nyāya Kusumānjali* that attempts to use the Nyāya system to establish the existence of God. Essentially, it is a treatise expounding the argument from design.

The word *nyāya* literally means that by which the mind is led to a conclusion. We are led to conclusions by reason and by argument. The popular usage of the word *nyāya* means "right" and so Nyāya as a system has come to mean the science of correct reasoning.

According to Nyāya, there are four methods of gaining knowledge (*pramāna*): direct perception (*pratyaksa*), inference (*anumāna*), comparison or analogy (*upamāna*) and verbal knowledge or testimony (*sabda*). In everyday experience, one uses any or a combination of these four methods to gain knowledge.

The Nyāya Sutras define each of these methods as follows. "Perception is that knowledge which arises from the contact of a sense with its object, and which is determinate [well-defined], unnameable [not expressible in words], and non-erratic [unerring]. … Inference is knowledge which is preceded by perception, and is of three kinds, viz., *a priori*, *a posteriori* and "commonly seen."… Comparison [analogy] is the knowledge of athing through its similarity to another thing previously well-known. … Word (verbal testimony) is the instructive assertion of a reliable person."[77]

Suppose we see billowing smoke on the hill. This is visual perception and we *know* there is smoke on the hill. We infer that the smoke is caused by fire and

[77] S. Radhakrishnan and C. Moore, A Sourcebook in Indian Philosophy, p. 359.

conclude that there is a fire on the hill. This is knowledge by inference. The hill is shaped like a pyramid. This is knowledge of the shape of the hill through comparison or analogy. Historical texts say that the hill has been there for the last five centuries. This is knowledge of the age of the hill from reliable verbal testimony.

About ten years ago, several of my doctoral students asked me to explain how one does scientific research. I realised that the art of research is really the art of asking probing and relevant questions. So I tried to write down some general methods by which one may generate such productive questions. I ended up by writing down eight methods by which we may generate questions and gain some knowledge. These were: survey of relevant literature, observation of patterns, conjecturing theorems, re-interpretation of existing theorems, finding analogies, transferring ideas from one area to another, induction and checking converse propositions. Apart from the accidental acronym of 'socratic' suggested by these methods, it is easy to see that each of these really falls into one of the four methods outlined by the Nyāya system. Indeed, the method of survey is part of verbal knowledge. Observation is part of direct perception. Conjecture, induction, checking converse propositions are part of the process of inference. Finding analogies and transferring ideas are part of the process of analogy. Finally, re-interpretation is a combination of direct perception and inference. This is really the art of seeing something familiar from a new perspective.

Examples can be enumerated for each of these methods of knowledge in any particular field. Here are striking episodes from the history of science. In 1859, Dmitri Mendeleev was twenty-five and was a poor school teacher in Siberia. The knowledge of chemistry was meager at that time and the natural elements were slowly being classified. Mendeleev decided to organize these elements according to their properties and atomic number, that is, the number of protons in the nucleus. As he began to place the elements in columns, he discovered a periodicity in their properties and could correlate them to their atomic number. Mendeleev had stumbled on a mathematical key to the chemical elements. It was a moment of "Eureka" because at the time of Mendeleev, only sixty-three out of 92 natural elements were known and it was inevitable that there would be gaps in his listing. "The conception of gaps or missing elements was a scientific inspiration. It expressed in practical terms what Francis Bacon had proposed ... the belief that new instances of a law of nature can be guessed or induced in advance from old instances. ... In science we do not simply march along a linear progression of known instances to unknown ones. Rather, we work as in a

crossword puzzle, scanning two separate progressions for the points at which they intersect: that is where the unknown instances should lie in hiding. Mendeleev scanned the progression of atomic weights in the columns, and the family likenesses in the rows, to pinpoint the missing elements at their intersections. By doing so, he made practical predictions, and he also made manifest (what is still poorly understood) how scientists actually carry out the process of induction."[78]

Mendeleev's discovery organizes past knowledge by using analogies based on careful observations. Thus, direct perception (*pratyaksa*), analogy (*upamāna*) and past knowledge (*sabda*) are all involved. What is brilliant about it is the "gaps" in the table that point to new elements. This is the method of inference (anumana). Thus, this episode is a good illustration of a combination of survey, observation, conjecture and induction methods applied to gain knowledge.

An excellent example of the method of transfer (illustrative of using analogy to gain new knowledge) is given by an episode in the life of Archimedes. As he stepped into the bath tub, he observed that a certain amount of water was displaced proportional to his own weight. He conjectured what is now called the principle of buoyancy. The moment he realised he could transfer this idea to the problem the king had given him of determining whether the goldsmith had cheated the king of his gold when he made the crowns without destroying the crowns, it is said that Archimedes ran naked through the streets of Syracuse shouting "Eureka," for he had indeed found the solution to the problem he was thinking about.

A spectacular example of the method of re-interpretation is Einstein's theory of gravitation. In the Newtonian view, gravity was a force but for Einstein, it is the curvature of space. In Einstein′s theory, space itself is warped by the nearby presence of a massive body. Thus, a massive body like the sun would distort the space around it and the smaller bodies, like the planets, would have to move along the curved space. Einstein then created the mathematical theory of tensor calculus and differential geometry (much like Newton created the differential and integral calculus for his theory of gravitation), to describe the precise equations of curvature of space-time. His theory includes Newton′s theory but goes beyond it and explains observations that were inexplicable through the Newtonian model. For example, the anomalous advance of Mercury′s orbit around the sun and the

[78]J. Bronowski, The Ascent of Man, p. 205.

existence of black holes, both of which are due to the bending of light in large gravitational fields, are two instances of why Einstein′s theory is now accepted.

A superb illustration of the method of analogy and converse is given by the discovery of electromagnetism. In 1813, the Danish physicist, Hans Christian Oersted wrote, "One has always been tempted to compare magnetic forces with the electric forces. The great resemblance between electrical and magnetic attractions and repulsions and the similarity of their laws necessarily would bring about this comparison. An attempt should be made to see if electricity has any action on the magnet as such."[79] What Oersted proved by his researches was that electricity produces magnetism. This led the British physicist Michael Faraday[80] to ask if the converse was true: does magnetism produce electricity? He devised an experiment to show that this was indeed the case and this led to the mathematical theory of electromagnetism. Thus, we see how analogy and converse methods of inquiry can lead to profound discoveries.

There is another theme in the Nyāya philosophy that is worth highlighting before we conclude our brief survey of it. This concerns the relation between perception and language. When we see a cow, for example, we not only see the individual cow in front of us, but awaken within our mind the general shape or form of the cow and become aware of the class or genus of all cows. Thus, perception has this three-fold component to it. This is also the case even if the cow is not in front of us, but we say the word 'cow.' That is, even the usage of words in everyday language has this three-fold aspect: the individual word, the image or "shape" the word evokes, and the genus or universal suggested by both of these.

In verses 59-69 of Book 2, Chapter 2 of Gotama′s Nyāya Sūtras, we find, "There is doubt as to what a word (noun) really means, as it invariably presents to us an individual, form and genus. Some say that the word (noun) denotes [only an] individual, because it is only in respect of individuals that we can use [the demonstrative] "that."... [But] a word (noun) does not denote an individual alone, because it is not restricted to the latter. What is denoted by the word 'cow' is not the mere individual by itself, without any qualifications, and as apart from the universal (to which it belongs), but the individual as qualified by (and along with)

[79]S. Glashow, From Alchemy to Quarks, p. 333.

[80] There is an apocryphal story about Faraday and the Prime Minister. When he gave a demonstration of his discovery of electricity to the Prime Minister, the latter apparently asked him of what use is it, to which Faraday replied, 'I don't know, but someday you will tax it!'

the universal. ... [Nor] is it the genus [universal] alone that is meant by a word (noun), because the manifestation of genus depends on the form and individual. The meaning of a word (noun) is, according to us, the genus, the form and the individual. An individual is that which has a definite form and is the abode of particular qualities. The form is that which [indicates or] is called the token of the genus. The ′universal′ is the cause (or basis) of comprehension and cognition."[81]

Modern psychoanalysis has also come to a similar conclusion. In Jungian psychology in particular, we find the theory of archetypes. These 'archetypes' correspond to the ′universals′ referred to in the Nyāya Sūtras. In his book on Jung, S.F. Walker writes, "The key to understanding the Jungian approach ... lies ... in the concept of *image*. By emphasizing the image over the word, Jungian psychology differentiates itself from Freudian, Lacanian, and other psychologies that stress the task of interpreting the *language* of the unconscious. The term first used by Jung to designate what he would later call an *archetype* of the collective unconscious was "primordial image."... Since the term *archetype* designates an unconscious and unrepresentable element of the instinctual nature of the human psyche, the more proper term to use for one of the pictures of an archetype that the human mind is capable of representing is *archetypal image*. However, even though the term archetypal image proves useful in differentiating an unconscious archetype from an image or representation of it in human consciousness, both Jung and his followers frequently, though incorrectly, use archetype and archetypal image interchangeably."[82] It is interesting to see that in this ancient treatise of 300 B.C.E., a clear distinction is made between image and the universal.

The notion of forms and universals in the Nyāya philosophy is highly reminiscent of Plato′s theory of ideas and forms. Just as Plato exalts the dialectic and ultimately arrives at the "Idea of the Good," the Nyāya system also tries to arrive at some notion of 'God' through logic. "From effects, combination,... an everlasting omniscient Being is to be established."[83] This is the age-old "argument from design." Consequently, it can be seen as a "dualistic" view of the universe as opposed to the later systems like Vedānta, which present a "non-dualistic" view of the world.

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[81] S. Radhakrishnan and C. Moore, A Sourcebook in Indian Philosophy, pp. 369-370.
[82] S.F. Walker, Jung and the Jungians on Myth, pp. 3-4.
[83] S. Radhakrishnan and C. Moore, A Sourcebook in Indian Philosophy, p. 383.

The Nyāya Sūtras also devote a considerable portion to the art of debate and discussion. Since the goal of Nyāya was to sharpen the process of logical reasoning, minute attention was given to the subtleties of argumentation. In course of time, its finer observations regarding the theory of perception and its contributions to the theory of knowledge were over-shadowed by excessive attention to the art of debate and Nyāya philosophy became synonymous with argumentation. However, as can be seen from our brief survey, the Nyāya Sūtras are full of deep psychological insights and their study enhances our view of the universe.

10.2 Vaisesika

The Vaisesika philosophy derives its name from *visesa* meaning 'particularity.' Its emphasis is on the theory of particulars, and thus is pluralistic in its view. It is older than the Nyāya school and was founded by Kanāda around 300 B.C. Essentially, it is an early attempt at an atomic theory of the universe and consequently does not mention 'God', but later commentators felt that the atoms by themselves could not have created an orderly universe so they postulated a 'God' regulating the activities of the atoms. Below, we will give a brief survey of the original sutras of Vaisesika.

Before we begin, it is important to understand that the tenor of the Vaisesika system is really the beginnings of the scientific method. The word 'science' can be traced back to two Latin words, *scire*, meaning 'to know' and to *scindere*, meaning 'to cut, to dissect, to analyse, to take apart.'[84] The word ′scissors′ can be traced back to *scindere*. By contrast, the word 'religion' is derived from 'religio' meaning 'to bind, to put together, to unify'. Thus, from an etymological perspective, the words 'science' and 'religion' seem to be opposites. However, upon closer examination, we see that science refers to analysis and religion to synthesis. It is this view that is adopted in the approach of the Vaisesika theory. Both methods of analysis and synthesis are needed for an understanding of ourselves and the world around us. In the scientific method, we proceed by analysis, by subdivision, by refining our understanding of the component parts.

[84] The origins of *scindere* can be traced back to the Greek word *schizein* meaning 'to split'and this in turn can be traced to the Sanskrit word *chinatti* meaning 'he splits'. See http://www.biotech.wisc.edu/education/genwords.html
for an interesting discussion relating 'science' and 'scissors.'

At the same time, in science, we try to unify. But that unity is gained by a simultaneous perception of both the whole and its component parts.

The famous mathematician, Emil Artin tried to express this idea when he wrote, "We all believe that mathematics is an art. The author of a book, the lecturer in a classroom tries to convey the structural beauty of mathematics to his readers, to his listeners. In this attempt, he must always fail. Mathematics is logical, to be sure, each conclusion is drawn from previously derived statements. Yet the whole of it, the real piece of art, is not linear; worse than that, its perception should be instantaneous. We all have experienced on some rare occasions the feeling of elation in realizing that we have enabled our listeners to see at a moment′s glance the whole architecture and all its ramifications."[85] In its attempts to understand the nature of knowledge, the Vaisesika philosophy delineates "particulars" and at the end, uses the term *samavāya* or coherence, to refer to the instantaneous perception of the whole that Artin has referred to in the above passage.

This system divides the universe into six categories or *padārthas* called *dravya* or substance, *guna* or quality, *karma* or action, *sāmānya* or that which constitutes a genus, *visesha* or that which constitutes its uniqueness or individuality, and finally, *samavāya* or coherence. Each of these categories are again subdivided into further sub-categories. Without going into too much detail, we only indicate two of these sub-categories. For instance, substance is divided into nine sub-categories of earth, water, light, air, ether, time, space, self and mind (*manas*). The substances cannot exist without qualities of which there are seventeen: color, taste, smell, touch, number, extension or quantity, individuality, conjunction, priority, posteriority, thought, pleasure, pain, desire, aversion and will. The substances are affected by five kinds of action: upward motion, downward motion, contraction, expansion and movement from one spot to another. The first four qualities namely, color, taste, smell and touch are made up of indivisible atoms which have no dimension.

Let us begin by examining the six categories in some detail. Unlike the Nyāya system which gave a three-fold view of perception, Vaisesika gives us a six-fold view. Consider the example of Beatrice, the cow. When we see Beatrice, we see a cow (substance), we observe its color and shape (quality), we see it grazing (action) in the pasture. In addition, we are aware that Beatrice is a member of a larger family (genus) of cows, at the same time, we are aware of Beatrice′s

[85]E. Artin, Collected Papers, p. 534, Reading, MA, Addison-Wesley, 1965.

uniqueness (perhaps it has a beauty spot on its face) and finally, the unification of all these, a certain coherence.

In this brief overview, we will highlight some of the essential verses of Kanāda's Vaisesika. "Substance is not annihilated either by effect or cause,"[86] indicating that matter is indestructible, reducing everything to the atoms. In the subsequent chapters, it begins with an exposition of the theory of cause and effect. Then it proceeds to the manifold aspects of matter together with a detailed discussion of its qualities. From this, it proceeds to deduce the existence of mind. "The appearance and non-appearance of knowledge, on contact with the senses and the objects are marks of the existence of the mind."[87] In a remarkable verse, it deduces that there is only one mind: "From the non-simultaneity of volitions, and from the non-simultaneity of cognitions, it follows that there is only one mind in each organism."[88] After indicating that there can only be one mind, in subsequent verses, the treatise deduces the existence of the self or *ātman* from the action of the life breath. All of this, it says, is *adrista*, unseen or invisible. "The circulation of water in trees is *adrista*. The sun′s rays and their action on convection of wind is *adrista*. However, the action of air and fire is explained by the action of the earth. The action of the mind is explained by the action of the hand."[89] Finally, in verses that seem to echo the Bhagavadgīta, we find, "Pleasure and pain result from the contact of the self, senses, mind and object. Non-origination of that follows on the mind becoming steady in the self; after it, there is non-existence of pain in the embodied self. This is that *yoga*."[90]

Though the analysis is brilliant in that the treatise reduces ultimately to atoms, it finds itself in a quandary. Where does the knowledge of the combinations of atoms reside? This is its ultimate question. "Unique particularities reside in the ultimate substances. They are the factors that make for ultimate distinctions among these substances."[91]

Another feature of the treatise is how time, space, *ātman* and *manas* are classified under substance. Several sections of the writing are devoted to inquire into the nature of time and space. In a sequence of statements of impeccable logic, it

[86] S. Radhakrishna and C. Moore, A Sourcebook in Indian Philosophy, p. 388.
[87] Ibid., p. 391.
[88] Ibid., p. 392.
[89] Ibid., p. 393.
[90] Ibid., p. 393.
[91] Ibid, p. 399.

deduces the existence of “an intelligent agent.” “As from the motion of the chariot, we infer the existence of an intelligent guiding agent in the shape of the charioteer, so also we infer an intelligent guiding agent for the body. ... The intelligent agent is also inferred from the actions of breathing. ... From the fact of the wounds of the body being healed up, we infer the existence of the agent who would be like the master of a house repairing it.”

What is impressive about the work is its attention to detail concerning very abstract concepts. We have already mentioned how the notions of time and space are discussed. Another chapter is devoted to the discussion of the concept of ′number′ and how the mind apprehends such an idea.

In conclusion, the Vaisesika system indicates the beginnings of a scientific method both in investigating the external world and the internal world of the mind. In later systems, this attitude is expanded and amplified.