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6. The Mathematical Model in Plato and Some Surrogates in a Jain Theory of Knowledge*

Edith Wyschogrod

One of the generative questions in Benjamin Nelson's late work was: What accounts for the breakthrough insights which permit the reduction of all quality to quantity, the proclaiming of a mathematical reality behind the experiential immediacies of experience, and the affirmation of a homogeneous time and space the same throughout the universe, insights which characterize Western science. It is a question that simultaneously exercised Nelson and Joseph Needham, both consider it from an intercivilizational perspective. To put the matter in Needham's terms: "What was it that happened in Renaissance Europe when mathematics and science joined in a combination qualitatively new and destined to transform the world?"¹

Nelson first answers these questions by examining Western orientations and institutions of the twelfth and thirteenth centuries. He shows that in a "sacro-magical if sacramentalized" reading of creator and cosmos "there appears a stress upon the need and ability of men to know and explain natural phenomena by the principles of natural philosophy, to offer rational justification of their acts and opinions."² In the same context Nelson speaks of a two-fold commitment to the "concrete individual person," and to an "objective Universal." Armed with Nelson's questions (the subject of fruitful conversations long before the appearance of the article cited) I pondered the issues of whether these factors, already nascent in the epistemic structure of Plato's dialogues concerned with the Ideas, could not be displayed against an Indian system remarkably similar in hierarchical structure and philosophic intent. For, I thought,

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only in the light of these similarities would the key difference—the existence of an “objective Universal” in one and not the other—emerge. The same aim governs both the Platonic and Jain epistemologies, the overcoming of sense experience in order to attain a more adequate access route to truth. But, in the former, structures of universalization—the ideas of number and geometric form—lead to this overcoming while in the latter certain *ad hoc* extensions of sense itself are made to play this part. My paper in no way attempts to ground larger claims such as the existence of an ongoing tradition unbroken from Plato to the twelfth century. Nelson would be the first to puncture so ominously unhistorical a claim. I attempt rather to bring out the difference between a system which engages the constructs of a contemporary mathematics and eventuates in an *objective* Universal and one which fails to do so.

Both Plato and a Jain text, *The Tattvarthadhigama Sutra* of Śrī Umasvati with the commentary of Śrī Puṣyapada,³ argue that the knowledge of sensibles is merely preliminary to higher forms of knowing and that these in turn culminate in a highest or ultimate form of knowledge. Furthermore both the Jain and Platonic systems concur in claiming necessity, apodicticity and comprehensiveness or totalizing power for such knowledge. In the light of these common considerations I argue here that a difference in what are considered possible objects of knowledge by each system accounts for the positing of differently conceived faculties of knowledge. I argue further that the faculties alleged to attain higher knowledge in Jain epistemology are compatible with the Jain understanding of the objects of knowledge. Thus an internally consistent account of knowing is provided in a scheme which assumes a) the actuality of the material world but b) presupposes that knowledge of the world in some sense falls short of ultimate truth and c) lacks mathematical paradigms for providing a means of transition between the world of ordinary experience and that of final knowledge.

In order to support these claims it is important to clarify in advance how the possible objects of knowledge are understood in each system and how the transition from lower to higher knowledge is effected. In the Platonic account the move from lower to higher epistemological levels is achieved by conferring a unique status upon a class of objects, number and figure, which facilitates a transition between apprehension of the empirical world and the world of Ideas. When applied to practical ends these objects are still encumbered by visible images but when divested of their concrete applications they are themselves Ideas. The assumptions of arithmetic and geometry do not themselves constitute the ultimate ground of certainty, for mathematical hypotheses which may

appear certain to the mathematical sciences must be subjected to philosophical analysis. Ultimate knowledge involves the systematic relationship and harmony of the world of Forms in their hierarchical nature and as they control the world of experience. Mathematical knowledge is seen both as the model for and the prolegomenon to this ultimate vision.

The Tattvarthadhigama Sutra shares at least this basic assumption with the Platonic view: namely that there is a duplicity of Being which generates the appearance of things as multiple and temporal. However multiplicity and temporality themselves are not interpreted as giving rise to the notion of objects as numerable, to the operation of counting as such, leading in turn to a conception of number which can be freed from its empirical context.⁴ In consequence the transcendence of the spatio-temporal order must be achieved by the attempt to acquire transcendent knowledge without recourse to elements and relations other than those immediately given, those which the spatio-temporal continuum itself directly presents. The conditions for transcending the spatio-temporal world are seen as lodged within the perimeter of the world. Jain ontology presumes the materiality of the world (including not only matter but time, space and motion among its elements).⁵ No tertiary class of entities, that is entities which are neither material (in the broad sense suggested) nor spiritual, is predicated. Thus no object comparable to number and figure incorporating both the permanence and stability of the ideal realm and the multiplicity of the sensible realm is introduced. Only the world itself can be predicated as the object of knowing through which access to higher forms of knowledge can be acquired.

One further point remains to be clarified before pressing the claim that, despite their common supposition that knowledge of sensibles is preliminary to higher knowledge, the ontological status and character ascribed to the objects of knowledge in each system will determine the ground and structure of the faculties needed for the apprehension of these objects. This point relates to the Jain understanding of the ontology of sensibles. In the context of ordinary experience physical objects are so arranged that they appear to be governed by inviolable rules such as the rule that it is impossible for an observer to both be and not be in the same place at a given instant. The Jain system supposes that the laws governing temporal sequentiality and spatial contiguity are viable within the context of ordinary experience, but *relevant only to it*. No immutable laws of nature such as are assumed by Platonic or Aristotelean metaphysics which would militate against the disruption of the perceived order of the world are presupposed. The spatio-temporal order of nature is seen as

applicable within the parameters set by sense experience but is nowhere interpreted as having eternal and necessary status.⁶

Since, as we have already seen, no entities comparable to mathematical objects are posited the world of sensibles remains the only object of knowledge. Thus a faculty which could provide the transition from lower to higher knowledge must have the world (of objects and persons, etc.) as its only cognitive sphere. Furthermore that faculty need not be governed by the laws that sense perception leads one to believe are inherent in the nature of things. Having laid down these premises, it becomes possible to posit "supernormal" powers (clairvoyance and telepathy) as faculties which can mediate the transition from sense perception to the final phase of knowledge, omniscience.⁷ These powers function as epistemological alternatives to the mathematical model in Plato's account of knowing in the sense of providing a link between graded levels of knowledge. But rather than multiplying entities (as the ontological status conferred upon Mathematical Ideas compels us to do) the Jain model assumes the permeability of the physical and mental (a quasi-physical concept)⁸ worlds to Spirit so that the occult powers predicated enable the adept to penetrate the physical order.

The epistemological course chosen by Plato is to posit objects which are neither entities found in the world nor mental "objects" corresponding to them. Thus existents need not be "penetrated" or rearranged. Plato's account of knowledge seeks to resolve the perplexity arising from "the sea of change" by *diverting attention from the world of aisthesis*, that is from "the world of sensations and judgments in accordance with them."⁹ Arithmetic as the science of number has this salutary effect for its objects lack specific referents: "Arithmetic has a very great and elevating effect compelling the soul to reason about abstract number, and rebelling against the introduction of visible or tangible objects into the argument."¹⁰ Geometry, while making use of visible forms and reasoning about them is not thinking about these "but of the ideals which they resemble, not of" the figure geometers draw but of the absolute square and the absolute diameter.¹¹ The positing of mathematical objects makes it possible for the mind to become the percipient rather than the eye.

For the *Tattvarthadhigama Sutra* and its commentator the soul's percipience depends not upon the ontological status of the object beheld but upon the elimination of karmic accumulation from the soul. Karma is specific to the various modes of cognition. Thus to attain supernormal powers the karma appropriate to preceding modes of cognition in addition to the karma obscuring the power that the knower wishes to achieve must be eliminated in order to "cut through" the world of perception.¹² Compare Socrates' view of the soul's function:

But in my opinion, that knowledge only which is of being and of the unseen can make the world look upwards, and whether a man gapes at the heavens or blinks on the ground, seeking to learn some particular of sense, I would deny that he can learn, for nothing of that sort is a matter of science; his soul is looking downwards and not upwards whether his way to knowledge is by water or by land, whether he floats or only lies on his back.¹³

with that of Śrī Pujyapada:

The disciple asks the saint with reverence, "O master, what is good for the soul?" The Saint says, "Liberation." He again asks the saint "What is the nature of this liberation, and what is the way to attain it?" The saint answers, "Liberation is the attainment of an altogether different state of the soul, on the removal of all the impurities of karmic matter, and the body, characterized by all the inherent qualities of the soul such as knowledge and bliss free from pain and suffering."¹⁴

It is instructive from the standpoint of our argument (that objects of knowledge determine the character of the faculty which apprehends them) to notice the end or goal towards which knowledge in each case tends. For Plato the object of genuine knowledge is being and the unseen for which Mathematical Ideas provide the model. For Jain epistemology the end of knowledge is freedom from attachment to the body and liberation from the variety of standpoints according to which a thing may be viewed. A fundamental doctrine of the Jain system holds that since contradictory attributes may be predicated of a thing, no affirmation can be regarded as absolutely true or false, the truth or falsity of an affirmation depending upon the standpoint from which the affirmation is made. The liberated soul transcends the relativity of viewpoint provided by modes of knowledge less encompassing than total omniscience.¹⁵ The motive that engenders the quest for knowledge is the desire for release, for the avoidance of pain, for infinite perception viz., for the knowledge of substance without reference to its shifting conditions or modes.

The notion of standpoints which govern the apprehension of truth at any given level of knowledge is foreign to Plato's conception of truth since it is precisely the independence of mathematical truths from the standpoint of the thinker and from the conditions of contingency inhering in the sensible world which confers certainty upon the objects of mathematics. While mathematics may be said to "liberate" from the world of sensible objects, the knowledge to which it provides a link is not that of undifferentiated oneness but rather to the hierarchically organized

world of Forms governing the realm of experience.¹⁶ The role of the Ideas is crucial in this connection for it is through the Ideas that the many particulars are integrated into a totalizing scheme: the many sensibles may be united through participation in a single Idea. While this doctrine is governed by the notion of "one over many" as Aristotle alleges, it need not be interpreted as presupposing that Plato understands the Ideas in a univocal sense. In fact a number of interpretations is proffered each of which can still be subsumed under the conception "one over many." Plato means to include as Ideas: ethical and aesthetic notions such as those of the Good, of Justice, of Beauty; Ideas of metaphysical notions such as the One and the Many, Being and Non-Being etc.; Mathematical Ideas such as those of the circle, the diameter etc. of the geometer and numbers such as two, three etc. of the arithmetician; Ideas of natural kinds such as man, stone, etc.; Ideas for kinds of manufactured objects, tables, chairs, beds etc.¹⁷ In each of these instances Plato is guided by the notion that many particulars participate in a single Idea.

In Jain epistemology there are no such organizing archetypes enabling the lower to be taken up into the higher through participation (as the lower deriving its being from the higher). While Jain epistemology recognizes a number of cognitive modes—sense perception, scriptural knowledge, clairvoyance and telepathy¹⁸—no object of these modes serves simultaneously as an object of knowledge and an organizing principle for objects of an ontologically lower level. The indicator for epistemological difference is karma, since each cognitive mode is obscured by its own karmic variant.

Higher forms of cognition presuppose the destruction of karma so that the knowledge conferred by the higher faculties manifests itself upon the ground of the soul. Such knowledge is termed "direct" (without the intermediation of the sense organs) and eliminates the temporal and spatial sequentiality characteristic of indirect cognitive modes. Direct knowledge is seen to be independent of what we might term "incoming data." The data given to the higher faculties are not different in kind from those of sense experience and its derivatives: rather they are perceived without relation to events contiguous to the observer and organized without reference to the modes of organizing data characteristic of ordinary experience. It is thus not the character of the data which changes but rather their principles of organization.

It would seem that *the adept* apprehends data in their plenary presence but *we* take it that two independent series of data are juxtaposed so that two discrete series are experienced as a single event. Thus event A (let us say the death of a man in Bengal) belongs to a series of events (viewed spatially) that are accessible only to those in his immediate vicinity in Bengal. A quite different series of events is accessible to observer A' in Gujarat. Two series of events normally unconnected by relations of

proximity are now linked through the interest of observer A' in the death of the man in Bengal. Clairvoyance enables the adept to implement his "interest" by bringing into contiguity in the mind of a single observer two disparate series. The power of the observer is able to transcend the normal relations of temporal and spatial sequentiality through the development of a power which no longer requires the presence of physical objects in order for perception of these objects to take place.

An analogous case is made for telepathy: one grasps what another is thinking without reference to spoken utterance. While the theoretical suppositions underlying the relations of language to thought are not stated in the *Tattvarthadhigama Sutra* nor in the commentary, it would appear (however) that thinking is an infra-auditory linguistic process, a form of speaking which can be understood by one who possesses the appropriate faculty.

It is instructive to notice how the Sutra regards specific types of clairvoyance and telepathy. Two modes of clairvoyance are posited, one based on birth the other produced by the tranquillization and annihilation of karmic matter depending upon merit.¹⁹ There are also two varieties of telepathy: one "straight," the other "curved" or winding. "Straight" telepathy enables the adept to acquire knowledge of "speech, body and mind" when these are the objects in the mind of another. "Curved" telepathy need not have recourse to objects; it attains access to past and future. The temporal extensiveness of the two differs in that the former is alleged to cover only several births; its spatial range is thought to cover in distance from two to eight miles but not beyond it. The latter is said to cover from seven to eight births in the past and future of oneself and others and is said to range spatially from eight miles "up to the entire abode of human beings."²⁰

The doctrine underlying these examples, namely that preceding existences can be recalled, ought not to be confused with the Platonic doctrine of recollection. In the *Meno* we notice that recollection is of principles, their application being a matter of deductive inference. Thus knowledge of the nature of squares and triangles enables one to deduce the relationship between the area of a square and the length of its sides and to then recognize that if one wishes to construct a square whose area will be twice the length of its sides one cannot do so by doubling the length of the sides.²¹ For Plato knowledge derived from recollection does not yield information about sense experiences but knowledge of general principles.

Moreover, the primary purpose in introducing the recollection theory, as the *Phaedo* clearly establishes, is to demonstrate the pre-existence of the soul. In the *Phaedo* Plato presumes archetypal forms and copies which resemble them. An ideal standard must be known before a judgement can be made about sense particulars, that all sensible things aim at this

standard but fall short of it,²² and furthermore that we "acquire this knowledge before we were born, and were born having the use of it." The position is summarized thus:

Then may we not say . . . that . . . there is an absolute beauty, and goodness, and an absolute essence of all things; and if this which is now discovered to have existed in our former state, we refer all our sensation, and with this compare them finding these ideas to be pre-existent and our inborn possessions—then our soul must have had a prior existence, but if not, there would be no force in the argument.²³

It is only in the *Republic* that mathematical knowledge provides the same function as clairvoyance and telepathy in the Jain system, since it is here that mathematical knowledge is seen as the stepping stone between the world of appearances and that of intelligible forms. Here a new view of knowledge is put forward which assumes the centrality of dialectic, a method of philosophical analysis conducted without reliance upon the data of sense perception and credited with being able to arrive at unquestioned first principles. In the simile of the line, Plato divides the intelligible world into two regions: that of mathematics and that of dialectic, each characterized by methodological differences in the attainment of its conclusions. The former may still use visible representations of its constructs while the latter is occupied with purely intelligible forms.²⁴ Furthermore both begin from hypotheses, the mathematician treating them as if they were first principles and arriving at conclusions without questioning initial assumptions, the dialectician treating hypotheses as hypotheses and nothing more. Dialectic recognizes the tentative character of hypotheses and uses them only to arrive at first principles. It is then possible to retrace the steps involved in reverse order and thus, descending, to arrive at conclusions which are solidly founded.²⁵ Accordingly the verification of the principles of arithmetic and geometry is not a matter of probable induction starting from particular facts of sense experience but is obtained by logical deduction from self-evident first principles.

The Jain logician also recognizes deduction as a legitimate mode of inference. Thus (to cite a common example) observing smoke on the hill, and knowing the invariable concomitance of smoke and fire, we are led to conclude that there is fire in the hill. But, the Jain logician argues that the premises themselves are based on sense experience and therefore deductive inference counts as sense knowledge. The same karma which obstructs sense experience is also alleged to obstruct correct inference.

Such knowledge is, in fact, classified as “indirect” in contradistinction to clairvoyance and telepathy. Jain epistemology stresses that “sensory cognition, remembrance, recognition, induction and deduction are synonyms,”²⁶ since the karma obstructing each is of the same type. In this sense the Jain view is close to that of simple empiricism in maintaining that (short of omniscience) knowledge is based upon the percepts and their relations.

Despite its inner coherence, the difficulties of a scheme which depends upon the violation of basic physical principles is obvious. However the Jain system manages to maintain a certain economy by avoiding the multiplication of entities qualitatively different from those found in the world of appearances.²⁷ In the Platonic scheme not only are ideal entities posited such as the Mathematical Ideas but, to make sense of these, other additional entities are required. Aristotle argues that Plato considered it necessary to furnish ideal perfect instances of the Mathematical Ideas and so posited the existence of intermediate ideal objects, Mathematical Numbers, involving the existence of identical units which are multiple like sense particulars but share the mode of being of eidetic entities.²⁸ Mathematical Numbers thus removed some difficulties in the understanding of mathematical operations engendered by the view that Mathematical Ideas are themselves unique and nonassociable through arithmetic processes such as addition etc. Aristotle summarizes the case thus: “Some (Plato) say both kinds of numbers exist that which has a before and after being identical with Ideas and Mathematical Numbers being different from the Ideas and sensible things.”²⁹ Aristotle characterizes the Mathematical Numbers as being made up of ideal units or ones each of which is identical with every other. “Mathematical Number is counted thus—after 1, 2 (which consists of another 1 besides the former 1) and 3 (which consists of another 1 besides those two), and the other numbers similarly.” Comparable geometrical entities are also presumed to have been posited by Plato.³⁰

This view of arithmetic structure permits solution of what has been called the “ontological methexis” problem, that is the question of how each object remaining solidary (monadic) can combine with other objects into groups or assemblages. The solution is suggested by the nature of Ideal and Mathematical Numbers. Existing objects can participate in a genus since the genus exhibits the mode of being of arithmos, that is it exhibits the mode of being of each ideal number, yet its members, like the homogeneous monads in the realm of Mathematical Number (which are themselves outside change and time) can nevertheless be arranged into definite numbers.³¹ It is clear that for Plato the sense world is transcended by organizing the multiplicity of sensibles into more comprehensive

assemblages and by using the objects of arithmetic and geometry to provide a model for the world of Forms. The Jain scheme depends on no such model for its assumption is that while knowledge of sensibles can become increasingly comprehensive, no objects or relations in that world, and no faculty commensurate with it, however complex, can serve as a paradigm for ultimate knowledge. For Jain epistemology no mode of cognition will satisfy apart from total omniscience in the sense ascribed to it in the body of this paper.

NOTES

1. Joseph Needham, *Science and Civilisation in China* (Cambridge: Cambridge University Press, 1954-), III, p. 150.

2. Benjamin Nelson, "Sciences and Civilizations, 'East' and 'West,' Joseph Needham and Max Weber," *Boston Studies in the Philosophy of Science II* (1974):445-493.

3. The *Tathvarthadhigama Sutra* of Śrī Umasvati was composed as early as the period of the oldest Jain commentaries and crystallizes an early and much respected epistemological tradition. Its date is given as 300 A. D. The commentary of Śrī Puṣyapada is the oldest extant commentary on the *Sutra* and accepted as definitive by the logician Śrī Akalanka Deva in his *Rajavartika*. The *Sutra* together with the commentary will be taken as representative of the Jain epistemological literature. See Preface to *Tathvarthadhigama Sutra* of Śrī Umasvati with the commentary of Śrī Puṣyapada translated by S. A. Jain (Calcutta: Vira Sasana Sangha, 1960). An exhaustive list of translations of the *Sutra* can be found in Karl Potter (ed.), *Encyclopedia of Indian Philosophies* Vol. I (Delhi: Institute for Indian Studies by Motilal Banarsidas, 1970). This essay follows the translation of S. A. Jain cited above.

4. I do not allege the absence of mathematical speculation during the formative period of Indian philosophy or afterwards since such an assertion is both contrary to fact and besides the point. I do not believe that the mathematical model does not provide the criteria governing the determination of truth in the Indian philosophical systems. Beyer in *A History of Mathematics* (John Wiley and Sons, 1968) writes that our notation for integers and an equivalent of the sine function in trigonometry are significant ancient Indian contributions (p. 237). However, there is a marked lack of continuity of tradition so that such events are sporadic (p. 229).

5. The non-living (ajiva) encompasses an elaborate structure including not only matter but time, space and motion among its elements. For general accounts see Surendrenath Dasgupta, *A History of Indian Philosophy*, Vol. I (Cambridge: Cambridge University Press, 1963), pp. 189-190 and pp. 195-198. Sarvepalli Radhakrishnan, *Indian Philosophy* (London: George Allen and Unwin, 1923), pp. 312-325. M. Hiriyanna, *Essentials of Indian Philosophy* (George Allen and Unwin, 1949), pp. 62 ff. and P. T. Rau, *The Philosophical Traditions of India* (London: George, Allen and Unwin, 1971). For detailed accounts see S. T. Stevenson, *The Heart of Jainism* (London: H. Milford, 1915), pp. 106 ff. Walter Schubring, *The Religion of the Jinas*, tr. by Amulachandra Sen and T. C. Burke (Calcutta: Sanskrit College, 1966), pp. 16-18. and Mohan Lal Mehta, *Outlines of Jaina Philosophy* (Bangalore: Jain Mission Society, 1954), pp. 26 ff.

6. The Jain doctrine of *anekanta* presumes that there is no privileged vantage point from which judgments may be made. All knowledge is relative to the standpoint of the observer: sense experience is only one of a variety of modes of experience. Jain epistemology holds that an object can be viewed from different points of view: existent, non-existent, one, many, identical, different, etc. Every object possesses indefinite attributes (*dharma*s) which are taken as actually existing in the object. When making a judgment the observer selects an aspect of the object. The term *Syat* is used to designate a particular point of view, i.e. from this aspect the object is such and not otherwise. For example, from the point of view of his father Anand is a son, but from the point of view of his brother he is a brother etc. The object itself is *anekanta*, a substratum which bears numerous characteristics.

Judgments regarding any object can be made in seven ways: Using the often cited clay pot as an example, perspectival judgments can be schematized as follows:

1. Relatively the pot exists.
2. Relatively the pot does not exist.
3. Relatively the pot does and does not exist (although not in the same respect).
4. Relatively the pot is indescribable.
5. Relatively the pot exists and is indescribable.
6. Relatively the pot does not exist and is indescribable.
7. Relatively the pot exists, does not exist and is indescribable.

Where the law of contradiction appears to be violated the conjunctive expression is to be taken as designated different standpoints from which each conjunct can be seen as true, i.e. true from that limited point of view. See Mohan Lal Mehta, *Outlines of Jaina Philosophy*, pp. 117 ff.

7. The Jain canons consider knowledge as divided into five categories: *abhinibodhika*, *sruta*, *avadhi*, *manahparyaya* and *kevala* (perception, scripture, clairvoyance, telepathy and total knowledge respectively). Two broad divisions are later added under which these five are subsumed: *pratyoksha* and *paraksha* (direct and indirect respectively). Perception is, in the *Tattoarthadhigama Sutra*, counted as indirect as is scriptural knowledge. See Mohan Lal Mehta, *Outlines of Jaina Philosophy*, pp. 85 ff. and Nathmal Tatia, *Studies in Jaina Philosophy* (Benares: Jain Cultural Research Society, 1951), Sanmati Publication number six, pp. 61–70.

8. The notion of what constitutes the mental realm is quite complicated in Indian systems. Suffice it to say that such functions as perceiving, deducing, willing, etc. are seen to be “mental” and belong to the materiality of the world as contradistinct from the power of spirit which cannot be reduced to mental acts. See Mohan Lal Mehta for the Jain application of this principle, p. 97.

9. See Norman Gulley, *Plato's Theory of Knowledge* (London: Methuen and Co. Ltd., 1962), p. 48.

10. *Republic* VII, 526

11. *Republic* VI, 510.

12. See Nathmal Tatia, *Studies in Jaina Philosophy*, chapter IV, Mohan Lal Mehta, *Outlines of Jaina Philosophy*, chapter VI for detailed discussion of Jain doctrine of karma. An older account can be found in Jagmenderlal Jaini, *Outlines of Jainism* (Cambridge University Press, 1916), pp. 26 ff.

13. *Republic* VII, 529.

14. Śrī Puṣyapada, *Sarvarthasiddhi*, p. 1 f.

15. Mailisena Syadvamanjari, *A Commentary on the Examination of the Thirty-two Stanzas of Hemacandra*, XXIII. For general accounts of this view see Dasgupta, *A History of Indian Philosophy*, Vol. I, pp. 179 f., and Radhakrishnan, *Indian Philosophy*, Vol. II, pp. 294 f. Bimal K. Matilal in *Epistemology, Logic and Grammar in Indian Philosophical Analysis* (The Hague: Mouton, 1971) contrasts the Jaina doctrine with that of the Advaitins and the Madhyamikas. The latter two regard the character of the phenomenal world as indeterminable: it is not a

merely fictive phenomenal realm but has a provisional existence, neither real nor unreal. Its character is logically indeterminable. For the Nyaya-Vaisesika any theory as to the character of phenomenality can be a valid theory concerning the character of the real: cause and effect are taken to be actual relations and the theory of causality a valid theory. The Madhyamika not only reject the validity of the claims of any theory of the phenomenal world but claim further that no theory concerning its character can be demonstrated. All such theories can be shown to be internally inconsistent. The Jaina takes a stand midway between these views arguing that each theory of the phenomenal world is consistent with a standpoint, but not absolutely valid. Thus if x is a particular theory of reality, given certain presuppositions from which x follows, an interpretation can be given to x such that x is true. For an account of the Jain doctrine of "tropes" or the acknowledgement of the validity of the positions of other Indian epistemological schools as partial views of the truth see P. T. Rau, *The Philosophical Traditions*, pp. 98 ff.

16. Since the mathematician may begin by studying sensible phenomena and then proceed to intelligible forms, the double interest results in a double function for mathematics: as propaedeutic to the knowledge of intelligible realities and as an instrument for describing and arranging the everyday world. See Robert Brumbaugh, *The Role of Mathematics in Plato's Dialectic* (Chicago: University of Chicago Libraries, 1942), p. 70.

17. I am indebted to Anders Wedberg, *Plato's Philosophy of Mathematics* (Stockholm: Almqvist and Wiksell, 1955), p. 32 for this classification.

18. The Jain canons (See *Supra* note 9) do not change in the Sutra in this regard. The claim is made that this conception predates Lord Mahavira (the most recent founder and twenty-fourth *tirthankara* of Jainism).

19. Sri Pujiyapada, *Sarvarthasiddhi*, p. 33.

20. Sri Pujiyapada, pp. 34 ff.

21. *Meno*.

22. Norman Gulley, *Plato's Theory of Knowledge*, p. 28.

23. *Phaedo*, 75.

24. For the Pythagorean background of the physical representation of number see W. K. C. Guthrie, *A History of Greek Philosophy*, Vol. I (Cambridge: Cambridge University Press, 1962), pp. 242 ff. For the extent to which mathematical representation is said to characterize non-mathematical cases see Robert Brumbaugh, *Plato's Mathematical Imagination*.

25. See T. Heath, *A History of Greek Mathematics* Vol. 1. (Oxford University Press, 1921), p. 290; Anders Wedberg *Plato's Philosophy of Mathematics*, pp. 103 ff. and Richard Robinson, "Hypothesis in Plato," Gregory Vlastos (ed.), *Plato* (Doubleday, 1971), pp. 110 f. The position is summarized in Plato's *Republic* 511 thus:

And when I speak of the other division of the intelligible, you will understand me to speak of that other sort of knowledge which reason herself attains by the power of dialectic, using the hypotheses, not as first principles, but only as hypotheses—that is to say, as steps and points of departure into a world which is above hypotheses, in order that she may soar beyond them to the first principles of the whole; and clinging to this and then to that which depends on this, by successive steps she descends again without the aid of any sensible objects, from ideas through ideas, and in ideas she ends.

26. Sri Pujiyapada, *Sarvarthasiddhi*, p. 21.

27. This means only to apply to idea entities as ideal number but not to processes which in Jainism include action, time, space, motion, rest etc. See *Supra*, note 3.

28. The passages in *The Philebus*, 56c–59d and 61d–62b are interpreted by Wedberg as providing evidence for the accuracy of Aristotle's account in that they point to a separation between dialectic and philosophical arithmetic, the latter described as the study of numbers

which are not Ideas. These passages are also seen as pointing to eternal exemplars of geometrical Ideas. See Anders Wedberg, *Plato's Philosophy of Mathematics*.

29. Aristotle, *Metaphysics*, 1080 b, 11–14.

30. Aristotle, *Metaphysics* 1080 a, 30–33. See Leon Robin, *La theorie platonicienne des idées et des nombres*, p. 625. Anders Wedberg, *Plato's Philosophy of Mathematics*, pp. 116 ff.

31. Jacob Klein, *Greek Mathematical Thought and the Origins of Modern Algebra* (Cambridge: Massachusetts Institute of Technology Press, 1968), pp. 90 ff, and pp. 100 f. adds to this discussion by citing Aristotle's refutation of the Platonic view based on the mode of being Plato ascribes to mathematical objects (*Metaphysics*, 1076 a, 36 ff). Aristotle argues for the natural meaning of *arithmos*: "To be present in number is to be some number of a given object," (*Physics*, A 12, 22, 1b). Attributes such as white, round, etc., are arrived at by disregarding certain other attributes of a thing enabling one to extrapolate a quality apart from its contextual nexus. This quality can be predicated of other objects where, in turn, certain other qualities had been similarly disregarded. By subjecting the *aistheta* to this procedure, numerical aspects of being can be ascertained. Number is no longer subject to the senses, yet it does not have any independent ontological status. The mind tends to "think the mathematical objects which are not separate as if they were separate when it thinks them." (*De Anima*, 7, 431 b).