"Atomistic mode of thinking" as exemplified by the Vaiesika philosophy of number

"ATOMISTIC MODE OF THINKING" AS EXEMPLIFIED BY THE *VAIŚEṢIKA* PHILOSOPHY OF NUMBER

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What is the "atomistic mode of thinking"? By this I understand an attempt to reduce any object of cognition to a set of indivisible ultimate units and, further on, to explain it in terms of these units as being the result of their aggregation, addition, conjunction, disjunction, succession, simultaneity and so forth. The "atomistic mode of thinking" constitutes surely a form of discursive analysis, but unlike the latter which is not entailing any ontological implications, it is always loaded with certain world construction schematizations. Hence, at the end of "atomistic analysis", there has to appear an ontological picture of the ultimate and indivisible constituents of things[1].

The Vaiśeṣika school of Indian philosophy is, in my opinion, quite a characteristic example of this way of thought. Its universe contains not only the atoms of matter, but also the indivisible or "atomic" particles of time (*kṣaṇa*), space (*pradeśa*) as well as the ultimate units of motion (*saṃyoga-vibhāga*), qualities (*guṇas*) and of the thought process as such. All these units are involved in a complex network of interrelations like conjunction (*saṃyoga*), disjunction (*vibhāga*), destruction (*vināśa*), priority, nearness (*paratva*), posteriority, remoteness (*aparatva*) etc..

The Vaiśeṣika concept of numbers as studied by B. Faddegon, E. Frauwallner, K. Potter, D.N. Shastri and some other scholars[2], has been characterized as "frightfully intricate", " terrifically complex" and so forth, which emphasizes the extreme difficulty of its authentic understanding and interpretation. Perhaps, this puzzling complexity often associated with Indian scholasticism and also the common belief among the scholars that the Vaiśeṣikas were not really interested in numbers, contributed to the neglect of this

1 For more details see: Victoria Lysenko *The Philosophy of Nature in India. Atomism of the Vaiśeṣika School.* "Nauka Publishers", Moscow, 1986 (in Russian).

2 B. Faddegon. *The Vaiśeṣika System Described with the Help of the Oldest Texts.* Wiesbaden, 1969; E. Frauwallner. History of Indian Philosophy, vol. II, transl. into English by V.M. Bedekar, Motilal Banarsidass, 1973. *Indian Metaphysics and Epistemology. The Tradition of Nyāya-Vaiśeṣika up to Gaṅgeśa.* Ed., by Karl H. Potter, Princeton University Press, 1977, p. 112-113, 119-121; D.N. Shastri, *Critique of Indian Realism. A Study of the Conflict between Nyāya-Vaiśeṣika and Buddhist Dignāga School.* Agra University, Agra, 1964, pp. 143-146.

subject for understanding the philosophy of the system. Though it is quite true that the Vaiśeṣika did not display any mathematical concerns, its treatment of numbers seems to me to be one of the most impressive demonstrations of its specific way to tackle crucial ontological and epistemological issues.

I will refer primarily to Praśastapāda's *Padārthadharmasaṃgraha* (further PB-*Praśastapāda bhāṣya)* with the commentary *Nyāyakandalī* of Śrīdhara[3], where numbers were presented in a systematic manner, and to the *Vaiśeṣika sūtra* of Kaṇāda[4] – the basic text of the Vaiśeṣika tradition.

Firstly, I am going to examine some general premises of the Vaiśeṣika conception of numbers derived from PB (chapter on "Attributes: similarities and dissimilarities"); then I will compare the numerical scheme as presented in PB's chapter on number, with that in the chapter on measure. Further on, I will focus on Praśastapāda's analysis of the arising of duality; in connection with this, the Buddhist influence and the Vaiśeṣika response to it is discussed, and a new approach to Vaiśeṣika realism is proposed. Finaly, I will compare general strategies of treating numbers suggested by the Pythagorean and Vaiśeṣika traditions and their bearing upon the development of mathematics in Europe and India.

1. General characteristics of numbers (PB chap. VI – "Qualities – similarities and dissimilarities")

Since numbers (*saṃkhyā*) are considered in the Vaiśeṣika to be attributes or qualities (*guṇa*) of substance *(dravya),* this *darśana*, so I argue, has developed a kind of *attributive or qualitative philosophy of number* (though it is important to make reservations about our use of the term "quality"[5]). In what

3 *The Kashi Sanskrit Series, 173. Vaiśeṣikadarśana with Praśastapādabhāṣya of Maharṣi Praśastadevāchārya with Prakāśikā. Hindi commentary* by *Āchārya Ḍhuṇḍhirāja Śāstrī and ed. with introduction and Hindi-Translation of the Vaiśeṣika Sūtras by Śrī Nārāyaṇa Miśra.* Chowkhamba Sanskrit Series Office, Varanasi-1, 1966; *Padārthadharmasaṃgraha of Praśastapāda with the Nyāyakandalī of Śrīdhara.* Translated into English by G. Jha. Chaukhamba Orientalia, Varanasi, 1982.

4 *The Vaiśeṣika-sūtras of Kaṇāda with the Commentary of Śaṅkara Miśra and Extracts from the Gloss of Jayanārāyaṇa. Together with Notes from the Commentary of Candrakānta and an introduction by the translator.* Sanskrit text and English translation of Nandalal Sinha. S.N. Publications, Delhi, 1986.

5 As K. Potter remarks, "the English word "quality" usually suggests repeatability...but this is not the view expounded in the Nyāya-Vaiśeṣika system" (K. Potter. "Are the Vaiśeṣika guṇas qualities?" – Philosophy East and West, n. 4, 1954-55, p. 259-264).Thus it should be stressed that the Vaiśeṣika qualities as W. Halbfass maintains "are particular

follows, the attributive number theory will be often contrasted with the Pythagorean substantial numerology, where numbers are conceived as independent substances constituting the basis of things.

This, so to say, "attributeness" of numbers has produced considerable ontological, epistemological and methodological implications. Since the Vaiśeṣika numbers were held to be nothing but attributes they were always treated as inseparably bound with their respective substances (which were of nine classes: earth, water, fire, air, ether, time, space, *manas* and *ātman)* and in this sense, they appear – contrary to numbers in Pythagoreanism – to be devoid of independent and self-sufficient existence of their own.

The Vaiśeṣikas argue that numbers cannot belong either to *guṇas,* including the *guṇa* of number itself (we cannot speak about the number of *guṇas* as well as about the number of *the guṇa* number), nor to action (*karma*)[6]. One can draw from this the conclusion that the Vaiśeṣika numbers cannot be as universal as they are in the Pythagorean theory with its famous slogan "All is number". According to the Vaiśeṣika, even the basic number – the *eka* (unity) – as a *guṇa* belongs only to substances and thus it is not universally applicable either. What is more, since, from the Vaiśeṣika point of view, it is incorrect to apply numbers to numbers (as guṇas to guṇas)[7], it seems also incorrect to define a number by number, or numbers (for example, to say that 3=2+1).

Thus we may conclude that the conception of quantitative relationship and quantitative order, or in more general terms, the idea of quantity being a certain countable plurality has not been explicitly formulated in Vaiśeṣika. And as a result, there is no special category of quantity in the Vaiśeṣika system of categories like that in the system of Aristotle.

There is apparently ample reason why our authors never associate numbers with numerals or figures though by this time the latter were well known

spatiotemporal occurrences of colors, tastes, dimensions, and so on" (W. Halbfass. *On Being and what there is. Classical Vaiśeṣika and the History of Indian Ontology.* SUNY Press, Albany, 1992, p. 122).

6 *niḥsaṃkhyatvāt karmmaguṇānāṃ sarvaikatvaṃ na vidyate/(Vaiśeṣika-sūtra with the commentary Upaskāra by Śaṅkaramiśra VII.2.4*). "As far as actions and attributes are devoid of numbers, the universal oneness is not known" And even more concretely: *ekatvaikapṛthaktvayor ekatvaikapṛthaktvābhāvo 'ṇutvamahattvābhyāṃ vyākhyātaḥ* (VS VII.2.3): "The non-existence of the oneness and of single separateness in the oneness and single separateness is explained (in the same way as) the minuteness and greatness (is explained)". In other words, as the absence of minuteness and greatness in minuteness and greatness respectively is explained.

7 This doctrine of the classical Vaiśeṣika was revised in the Navya-Nyāya. See D.H. Ingalls *Materials for the Study of Navya-Nyāya Logic* Cambridge (Mass.) – London, 1951.

in India[8]. As a matter of fact, numbers were for them neither numerals, nor any other kind of abstract symbols, but words, notions and related universals (*sāmānya*). That is why we cannot find in our texts any account of mathematical operations like addition, subtraction, multiplication and division which were attested even in some Vedic texts. What interests Vaiśeṣika first and foremost are not mathematical abstractions in specialized calculations, but rather characteristics of concrete things in ordinary practice. Did the Vaiśeṣikas simply not know the mathematical use of numbers or did they know it, but did not take it in consideration? If the latter is the case, why did they leave it aside? There is no textual evidence to provide an answer to these questions.

As for numbers as universals, they are eternal (*nitya*), unitary (*eka*) and present in many particulars (*anekavṛtti*). For instance, when we perceive one object we simultaneously perceive the universal of "oneness" that resides in its guṇa. The role of numbers-universals in the process of cognition will be discussed later (see chap. 4).

What sort of *guṇas,* or attributes of things, do numbers constitute? According to the Vaiśeṣika, like the majority of *guṇas,* numbers are non-inherent causes or *asamavāyi kāraṇa* of things. Further, they create in the effect not only similar, but dissimilar *guṇas*[9]. As Šrīdhara explains: "Number one in the effect is produced by the similar quality of the number one in the cause; and from the numbers "two" and "many" are produced the dissimilar qualities of small and large dimension"[10]. On the other hand, unlike the qualities of smell, colour, taste, touch and sound which are specific (*viśeṣa*) *guṇa* of the great elements (*mahābhūta* – earth, fire, water, air) and as well as of *ākāśa,* number is considered a non-specific and non-specifying *guṇa,* or a generic *(sāmānya) guṇa.*

In other words, while smell, colour and other *viśeṣa guṇa* may help one to identify the earth, fire, etc., the *guṇa* of number cannot enable us to specify a substance in which it resides. Stated generally, the knowledge of numbers, in my opinion, is of no substantial heuristic value for the cognition of things in

8 By the time of Praśastapāda if he lived in 5 century A.D. at least two systems of numerals were known: *kharoṣṭhi* numerals found already in the Aśokan inscriptions, and *bhārati* numerals. See: chapter by S.N. Sen on Mathematics, in: *A Concise History of Science in India.* Chief ed. D.M. Bose. New Delhi, 1971

9 saṃyoga-vibhāga-saṃkhyā-gurutva-dravatva-uṣṇasparśa-jñāna-dharma-adharma-saṃskāraḥ samāna-asamāna-jāti-ārambhakāḥ / PB p. 64. "Conjunction, disjunction, number, gravity, fluidity, hot touch, cognition, virtue, vice and inertia produce [qualities] of the same and of a different kind". For more details about the translation of saṃskāra as inertia see "The Vaiśeṣika concept of motion" in: Victoria Lysenko. The Philosophy of Nature in India.

10 NK p. 220 (tr)

Vaiśeṣika. So, since all numbers (from two on – the number one, is a special case which we shall refer to later) differ from each other as far as the respective substances or *loci* differ, any kind of so-called number mysticism so characteristic of the Pythagorean conception, when some numbers are credited with mysterious capacities to affect the course of world affairs, appears to be utterly groundless in Vaiśeṣika.

But one of the most important problems for Praśastapāda (who paid it much more attention than Kaṇāda did) is the mode of the existence and cognition of the *guṇa* number. All specific *guṇas,* as well as some generic ones, arise and exist in things objectively whether we perceive them or not, while the genesis of numbers from two onwards depends on the observer. The Vaiśeṣika hold the knowledge of these numbers to depend on the observer's simultaneous cognition of more than one (*aneka*) object which is technically called *apekṣābuddhi* (literally, "relational cognition"). The dependence of the *guṇa* number (along with *pṛthaktva,* or separateness, *saṃyoga-vibhāga* or conjunction-disjunction, *paratva-aparatva*, or remoteness-nearness) on the cognition of more than one thing and thus on the position of the observer makes it a kind of "relational" and in a sense "subjective"quality.

Does it mean that numbers from two on are thus purely "subjective"? No, it does not. Having a subjective origin, they are still held by the Vaiśeṣikas to be objective, in other words, they are considered as objectively residing in those things with respect to which they have subjectively emerged. And, according to the Vaiśeṣikas, they disappear as soon as our notions of them are destroyed. For example, when with two jars at hand, we buy a third one, there occurs a destruction of the quality "two" and a rise of the quality "three" not only in our mind but in the jars themselves.

2. Praśastapāda on the guṇa "number"

Now I turn to the special section of PB on number. It opens with the statement that "number is a reason (*hetu*) of the usage of numbers beginning from "one""[11]. Thus Praśastapāda, unlike Jaina[12] and Pythagorean authors, includes "one" in the class of numbers, but, as we will see later, "one" stands quite apart from the other numbers of this class. Number as a *hetu* is a real

11 *ekādivyavahārahetuḥ saṃkhyā* / PB p. 74.

12 B.B. Datta. *The Mathematical Achievements of the Jainas*, – in: *Studies in the History of Science in India.* Vol 2. Ed. by Debiprasad Chattopadhyaya. New Delhi, 1982, p. 684-716.

factor (a *guṇa*), while "numbers" in usage, like "one" etc., are mere words. Anticipating the talk about the Vaiśeṣika realism, in what follows, I just like to draw attention to this quite typical "realistic" exertion to justify the usage of words and notions by referring to their counterparts in the real world. But what constitutes a "real factor" for number? Is it a real number or a universal? These questions we leave unanswered until a more appropriate occasion to treat them (it will be in connection with the discussion of the arising of duality in chapter 4). Now let us return to our exposition.

According to Praśastapāda, "number can inhere in one (*eka*) or more than one (*aneka*) substance"[13]. "When it inheres in one substance, its eternity or non-eternity is like the eternity and non-eternity of the atoms of water and other substances"[14]. "The number that is characteristic of more than one substances begins with two and ends with *parārdha* (100.000 billions)"[15] Thus the plurality ("more than one") is defined by pointing out its lower and higher limits. The latter is a fabulous number *parārdha* (*parārdha* is a multiple of ten – 10^{12}, that evidences the usage of the decimal place value system developed quite early in India[16]). Nevertheless in Vaiśeṣika, the *parārdha* is not a number *per se,* but the number of some substances.

Here we have to examine more closely the number "one", which is of quite special metaphysical importance in Vaiśeṣika. First, it is the only number that can be both eternal (when it inheres in eternal substances) and non-eternal (when it resides in non-eternal substances) and second, it exists as long as its *substratum* does. All the other numbers (from two on) are non-eternal because they always belong to composed and non-eternal substances. Third, the number "one" being not produced itself, it is exactly whereby as an *asamāvayi-kāraṇa* (non-inherent cause) the production of all the other numbers is brought about. Numbers from "two" onward cannot be produced otherwise than from the number "one".

Fourth, "one", or "oneness" (*ekatva*), along with its twin attribute of *eka-pṛthaktva* (separateness of one object or a "single separateness"), constitute a kind of objective *guṇas* just like colour etc., while all other numbers are *apekṣābuddhi guṇas* or dependent on relational cognition[17].

13 *sā punar ekadravyā cānekadravyā* / PB p. 74.

14 *tatra ekadravyāyāḥ salilādiparamāṇurūpādīnām iva nityānityatvaniṣpattayaḥ* PB p. 74.

15 *anekadravyā tu dvitvādikāparārdhāntā* / PB p. 74.

16 See: A chapter on History of Indian Mathematics by S.N. Sen in: A *Concise History of Science in India.* Gen. ed. D.M. Bose. New Delhi, 1971.

17 "Awareness", "intellection", "enumerative cognition", "sense of relativeness" – all these are different translations of *apekṣābuddhi*, but I prefer to use the term "relational cognition".

Finally, "one" as well as "single separateness" cannot enter into cause-effect relations with other members of their respective classes. If "one" is a single factor it cannot produce "two" and the like. Since the Vaiśeṣikas consider causal factors to be numerous, "one" (as well as "single separateness") taken alone might bring about only the other "one" (or another "single separateness").

In this respect, "one" as well as "oneness"(and "single separateness"), can by no means be applied to the relation of cause and effect. According to Kaṇāda, "as effect and cause are neither one (*eka*) nor are they two distinct things, oneness and single separateness with regard to them don't occur" (VS VII.2.7)[18]. Thus the "one" and "oneness" are not only a number and its universal, they have much more wide connotations symbolizing, as it were, the self-identity and unity of thing, while single separateness represents its individuality and singularity. Perhaps, for this very reason, the "oneness" as paired with the "single separateness", is articulating both the self-identical, or continuous and separate, or discontinuous nature of things.

Since the guṇa "one" belongs to things in an objective way, a question arises as to its perceptibility. Praśastapāda asserts that, unlike colour, smell, taste and other *guṇas*, always seized by only one sense organ (*indriya*), the numbers may be perceived by two *indriyas,* by the organs of vision and touch[19].

So we can detect a certain discontinuity between "one" and the other numbers. "One" is absolutely objective, the other numbers, being also objective, have a subjective origin. "One" is primary, the others are secondary; "one" is not produced, the other numbers are produced; "one" can bring about only similar effects, other numbers – dissimilar effects as well.

All this may give rise to a question whether "one" is a number like "two" etc.? There was a long discussion about the status of "one" in the history of Vaiśeṣika. To sum it up, certain Vaiśeṣika authors even doubted whether "one" belonged to the class of numbers at all and argued that it was a separate attribute. There were others who considered it to be only a universal, and those who regarded it as a separate category; some other suggestions were put forward too[20].

18 *kāryyakāraṇāyoḥ ekatvaikapṛthakvābhāvāt ekatvaikapṛthaktvaṃ na vidyate*, or as translates Nanda Lal Sinha, "Effect and cause are neither the same nor similar (in being equally distinguished from all other things); therefore Unity and (single) Individuality do not exist in them".

19 *saṃkhyāparimāṇapṛthaktvasaṃyogavibhāgaparatvāparatvadravatvasnehavegā dvīndriyagrāhyāḥ* I PB p. 61-62.

20 For the history of the discussion about the number "one" see Potter's *Introduction* to *Indian Metaphysics and Epistemology* p. 120-121.

3. Eka and parimaṇḍala

It seems to me that the general scheme of *eka-aneka* (one and many) relationship is based on the same premises as the Vaiśeṣika scheme concerning the relationship between the atom's minutest measure (*parimaṇḍala*) and the large measure (*mahattva*) of composed things.

Both the *parimaṇḍala* and *eka* are the ultimate atomic units of their respective *guṇas*. At the same time, both of them cannot cause the other varieties of *guṇas* within their own genus. As follows from the Vaiśeṣika viewpoint, the minute size of a single atom cannot bring into being a magnitude of gross things, because an addition of the ultimately small measures gives no increase of magnitude and thus results in the production of the same small measure[21].

So, the conclusion may suggest itself that both atom's measure and the number "one" while belonging to their respective classes of *guṇas* (that is, to measures and numbers), at the same time paradoxically transcend them. Hence, the former differs from the latter not only *in degree,* but more or less *in kind* as well. Being fundamental, both are nevertheless non-productive and thus in need of the *apekṣābuddhi* for their effects to be produced. Insofar as "one" cannot bring about the other numbers and the *parimaṇḍala,* or the atom's measure, cannot give rise to the other measures, the continuity within their classes of *parimāṇa* (measure) and *saṃkhyā* (number) may be due only to *apekṣābuddhi.*

Summing up my comparison of the PB sections on number and measure, I cannot help questioning some basic presuppositions of these two. For Praśastapāda, the measure of single atoms (*parimaṇḍala*), on the one hand, and of dyads, on the other, is of the same *aṇu* or minute genus[22]. As the Vaiśeṣikas did not pay much attention to quantitative difference between the sizes of one and two atoms, they ignored the degree of minuteness. In the

21 Thus, Śrīdhara asserts that the size of a dyad continues to be as minute as the size of the atom itself (See next footnote). Thus he has tried to follow Kaṇāda's postulate that an addition of two homogeneous qualities produces the increase in degree of this very quality, i.e. smallness may produce increase in degree of smallness. One may see in this the earliest anticipation of the idea that any finite sum of infinitesimal quantities will be infinitesimal, discovered in Europe only in times of Newton and Leibnitz. But it would not be quite correct because the Vaisesikas consider the possibility of increase of smallness of the *aṇu* to be an absurdity which may lead to " a lapse into regressive infinity". Thus, *aṇu* was for them a finite quantity.

22 As Śrīdhara points out: "Some people hold that the dimension of the dyad is produced by the dimension of the component atom. But if such were the case then the dyad too would be as minute or "atomic" as the atom itself" (NK tr. p. 297).

case of magnitude (*mahattva*), the degree begins from "three" onwards. The minimal unit of magnitude is thus "three". "Three" is also correlative with the notion of the *bahutva* (many-ness).

On the whole, one can distinguish two kinds of numerical oppositions in PB sections on numbers, on the one hand, and on measures, on the other. In the first one, the number "one" is opposed to all other numbers, to begin with two, as "*eka*" to "*aneka*" ("which is not one"). Unlike this, in the second section, there is an implicit opposition between "one" and "two", on the one side, and all the other numbers from "three" onwards, on the other. While the former may be presented in the following formalized series: 1, 1+1=2, 1+1+1=3, 1+1+1+1=4; and so on and so forth, the latter is as follows: 1,2, 2+2+2=3, 2+2+2+2=4. The plus (+) and equation (=) symbolize the intervening of the *apekṣābuddhi.* In the first series, the unit is "one", as for "two", it corresponds with the plurality or *aneka* ("more than one"). In the second series, the role of the minimal unit is played by "two", but the minimal quantity (*bahutva*) is "three".

It is important to emphasize that the second sequence was introduced by Praśastapāda and not by Kaṇāda himself. Praśastapāda formulates it in the following phrase: "A multitude appears in the atoms and the dyads due to the *apekṣābuddhi* of Īśvara, and when *these dyads produce effects in the form of the triads* etc., the multitude produces in them a colour along with a longness and a magnitude"[23]. Symptomatic enough is that Śaṅkaramiśra in his commentary on the Sūtra maintains the triad to be made up of three atoms[24]. Thus, there were at least two opinions on the numerical scheme of producing measure in Vaiśeṣika. The first one based on our first series was supported by Kaṇāda's commentators, like Śaṅkaramiśra. The other tradition based on the second sequence was introduced by Praśastapāda, advocated and elaborated by his commentators Śrīdhara, Vyomaśiva and Udayana.

What has compelled Praśastapāda to regard "two" as the *other kind* of measure than "three", though both were similar "*apekṣābuddhi*" numbers? Why, further, was a triad held to be a combination not of three singular atoms, but of three dyads? and why only a triad (that is, six atoms) and not dyads, or single atoms, have a capacity to bring about the size of gross things? Are we dealing here with a kind of Pythagorean ontology of numbers, which endows them with the capacity to produce things? If so, does this suggest that the numerical scheme of producing things from atoms runs

23 *tatreśvarabuddhim apekṣyotpannā paramāṇudvyaṇukeṣu bahutvasamkhyā tair ārabdhe kāryadravye tryaṇukādilakṣaṇe rūpādyutpattisamakālaṃ mahattvaṃ dīrghatvaṃ ca karoti* / PB, p. 90.

24 Com. on VS IV.1.8. See footnote 31, 32.

counter to the principles of the attributive conception of numbers as exposed in Praśastapāda's chapter on number? One may also wonder whether this difference in the Vaiśeṣika attitudes on numbers was derived exclusively by the logic of the atomistic conception.

To clarify these questions, it is important to bear in mind the Vaiśeṣika considerations about numbers with regard to atoms. According to Praśastapāda there are three ways in which objects are formed (1) summation of the component's magnitudes, (2) loose combination (*pracaya*) of components, and (3) increasing the number of components. In production of the atomic combinations at the beginning (*sṛṣṭi*) of the world cycle, it is only the third way which is tenable because: a) the atoms being minute can produce in the effect only a quality of the same kind, or minuteness, b) there is no loose contact between the atoms.

The more sophisticated argumentation was elaborated by Praśastapāda's commentators Śrīdhara, Vyomaśiva and Udayana. As maintained by Śrīdhara, a single atom cannot be productive, because if it could, it would produce its effects eternally and they would be indestructible. "Nor could the combination of three atoms be regarded as productive", because being something perceptible and thus made up of parts, a *tryaṇuka,* asserts Vaiśeṣika, has to be equally made up of constitutive parts which were in their turn effects. Therefore, its parts were *dvyaṇuka* (a substance-effect), but not three single atoms (substances-causes). And finally, two dyads do not produce perceptible things because it is not "two", but "three" (the minimum of plurality or *bahutva*) which is productive of the large measure of things[25]. This complicated and indeed artificial theory has been construed to adjust the principles proclaimed by Kaṇāda[26] with Praśastapāda's cosmogony.

Though in PB's section on the atom's measure, one can disclose a certain qualitative difference between numbers instead of the purely quantitative one in the section on numbers, this difference, in my opinion, could hardly be accounted for as a sort of Pythagoreanism[27]. For here, not numbers as such,

25 See: NK tr. 73-74.

26 The first principle was the rule that a quality can produce a quality of its own type and thus smallness cannot be a cause of the big dimension, the second that the cause of the perceptible thing must itself be a product.

27 As far as Pythagoreanism is concerned, it is important to note that numbers are regarded by Pythagoreans simultaneously as units, geometrical points and physical atomic bodies. The chain of production runs as follows: from points to lines, from lines to surfaces, from surfaces to solids, from solids to physical bodies. Thus the underlying productive scheme was, as it is easy to see, purely geometrical: each new stage was the result of the addition of the elements of the previous stage. The whole process of production was selfregulating and not in need of some conscious agent to rule its course.

but first and foremost the numerical combinations of atoms matter. And it is only to the atoms themselves and to their combinations that the difference *in kind* between the numbers "one", "two", "three" etc. seems to be due.

Besides, one may conceive here of an even more general problem pertaining to metaphysics in general, regardless of its concrete forms, either Western or Eastern. I refer to a problem of transition from Metaphysical to Physical, from One to Many, from Eternal to Transient, from Absolute to Phenomenal etc. All the authors of metaphysical systems eventually discover their metaphysical *prima causa* to be too pure and too perfect to initiate a production. Actually, the Absolute in metaphysics cannot be anything else, than a sterile entity, incapable of production. To be productive One needs something which is more than one, the Pure needs something, say, not so pure and perfect, like for instance *māyā* (principle of *illusion*), or *prakṛti* (matter), or even *avidyā* (ignorance). Thus an implicit or explicit duality may suggest itself as the only way out from the blind alley of sterility. It is symptomatic that all metaphysical, as well as religious systems, as far as they have tried to explain the transition from any kind of Absolute to the phenomenal world, *volens-nolens* have come to use dyads (like Self and non-Self in Fichte, matter and mind in dualist philosophical systems like that of Descartes and Sāṃkhya etc.) and triads (Hegel's thesis, anti-thesis, synthesis, Hindu Trimūrti, Christian Trinity etc.).

In another study[28], I argued that in Vaiśeṣika two different approaches to the atom may be distinguished namely, a physical and a metaphysical one. When taken as a physical object, the atom is made equal to a minimal quantity of matter endowed with its qualities. On the contrary, from the metaphysical viewpoint, the atom is treated like an Absolute devoid of all perceptible physical properties and opposed to the ordinary world. Not going into details of this distinction made elsewhere, I would like only to emphasize that it is exactly the idea of atoms as a kind of eternal and thus absolute entities that is accountable for the introduction of the second numerical scheme. By this scheme the need was met to bridge the imperceptibility of atoms (which is of principal character because it symbolizes the eternal and transcendental nature of absolute units) and the perceptibility of gross things. In more general terms, this scheme may be interpreted as the Vaiśeṣika's attempt to rationalize a transition from the metaphysical to the physical world.

28 Victoria Lysenko. *The Atomistic Theory of Vaiśeṣika: Problems of Interpretations*, in: *History of Indian Philosophy. A Russian Viewpoint.* Ed. by Marietta Stepanyantz. Indian Council of Philosophical Research. New Delhi, 1993, p. 67-70.

While a single atom is held to be imperceptible, a *tryaṇuka*, or a triad made up of six atoms, is considered to be the smallest perceptible entity. As for *dvyaṇuka* or a dyad, it plays the role of the intervening link, which as D.N. Shastri notes, "partakes of the nature of both, the object of our experience and the atom. Like the former, it is made up of parts, and like the latter, it possesses minute measure"[29].

Thus the question concerning the role of the numbers "one", "two" and "three", as well as of their interrelations, must be taken not in the light of their specific numerical properties, but starting only from the Vaiśeṣika understanding of the cause-effect relations between their respective *substrata*. Hence contrary to Pythagoreanism which stated bodies to be guided by numbers, Vaiśeṣika held numbers as being determined by the specific "absolutist" nature of the atoms.

To constitute the final causes of things, our atoms, in Vaiśeṣika terms, must be *samavāyi kāraṇa* or material causes. But to produce an effect, *samavāyi kāraṇa* has to be accompanied with other causal factors like *asamavāyi kāraṇa* (non-inherent cause) as well as *nimitta kāraṇa* (instrumental cause). For example, a production of a jar from clay (material cause) is not possible without colour and other qualities of clay (*asamavāyi kāraṇa*) and without special instruments (*nimitta kāraṇa*) like potter's wheel, stick etc. So, if single atoms endowed with their imperceptible qualities are not capable to produce things with their respective perceptible qualities, it is the *apekṣābuddhi* which comes to the fore. Thus we see that the Vaiśeṣika, like other metaphysical systems, has faced the paradox that an absolute *prima causa* (in our case singular atoms) could not in fact cause anything.

There is one more important question that suggests itself here. When *apekṣābuddhi* of Īśvara, to put it in Praśastapāda's terms, "introduces" a duality into two atoms, or "threeness" into three dyads, does it thus "create" the dyad etc. as an objective reality, or does it just unite two atoms (and then three dyads) in a sort of pure mental combination? The Vaiśeṣikas, as it seems, were obliged to accept the objective reality of dyads and other combinations of atoms, otherwise they could not explain the fact that instead of many single atoms there are continuous things we are dealing with in our experience.

What may follow from the above, is also that through the *apekṣābuddhi* not only magnitude and longness, but colour and, most probably, other "physical" qualities are again produced. Does that mean that the latter were not present in the cause, i.e. in single atoms? Or were these qualities hidden, unmanifested in the cause and came to manifest themselves only in the

29 D.N. Shastri. *Critique of Indian Realism,* p. 160.

effect? It seems that from Praśastapāda's viewpoint, both cases should be irrelevant, since, first, the qualities of atoms are as eternal as the atoms themselves. Second, the conception of manifested (*vyakta*) and unmanifested (*avyakta*) qualities is proper rather to Sāṃkhya than to Vaiśeṣika[30]. The similar question (how do phenomenal qualities emerge from absolute and pure *causa prima*?) is also well known to some other metapysical systems of India as well as of Europe.

Therefore, it is the most logical thing to assume that Praśastapāda refers here not to the production of qualities as such, but only to the arising of perceptible qualities. This brings us back to the crucial metaphysical question in Vaiśeṣika, i.e. that of transition from the imperceptibility of the absolute causes in the form of atoms to the perceptibility of the effects in the form of gross things.

Kaṇāda's formula for perceptibility runs as follows: "Perception of colour [arises] from its inherence in a combination of more than one substance and from a special [quality] of colour" (VS IV. I.8)[31]. Thus to be perceptible a thing must consist of some constituent parts. Śaṅkaramiśra in order to exclude dyads from the range of perceptible objects (see second numerical scheme) identifies *aneka* with "three"[32]. But here, he is not very consistent for he, as we have already noticed, considers a molecule to be made up of three atoms (the first numerical scheme).

So the *apekṣābuddhi* of Īśvara does not create qualities. What happens, is that through *adṛṣṭas,* or invisible effects of the previous *karma* of souls, the *apekṣābuddhi* makes the atoms combine into dyads and then the dyads – into triads. All this only for the sake of the moral trial of living beings to give them a chance of final liberation. In this example we can see a complicated

30 As W. Halbfass points out, "it (the Vaiśeṣika) tends to avoid the ideas of potentiality and latency, as well as the assumption of different modes of being. Instead, it tries to understand the world in terms of a combination, aggregation, and separation, but also substitution and replacement of definite, actual, distinct entities." *On Being and What there is*, p. 57.

31 *anekadravyasamavāyāt rūpaviśeṣāc ca rūpopalabdhiḥ*, VS IV. 1.8.).

32 As he states, "*rūpaviśeṣa*" means the species or peculiarity inherent in colour, and that consists of the characteristics of being developed to the degree of appreciability, of being unobscured, and of being colour. From this, perception of colour takes place. Lest it might be said that, such being the case, the colour of the ultimate atom as well as of dyad would be perceived, so it has been added – "*anekadravya-samavāyāt*". The word "aneka" denotes multitude; hence "*anekadravya*" means that to which many substances belong as its substratum, e.g. a molecule of three atoms, and the like". Commentary on VS IV. 1.8. *The Vaiśeṣika Sūtras of Kaṇāda with the Commentary of Śaṅkara Miśra.* Translated by Nandalal Sinha, p. 151-152.

and intriguing interlacing of soteriology with metaphysics and philosophy of nature.

But to understand this, so to say, cosmogonic act of Īśvara properly, we should make clear what is the *apekṣābuddhi's* role in it. One is tempted to regard the *apekṣābuddhi* as quite similar to Greek *Nous,* Cartesian Mind or Newtonian Reason. But it must be born in mind that the *apekṣābuddhi* is a distinct cognitive or reflective act grasping several things at a time, and consequently, it is nothing like substantialized intellectual capacity. In the course of *sṛṣṭi* or "creation" (which is not a creation in a proper sense of the word) of the world, dyads are resulting out of Īśvara's simultaneous cognition of two atoms, triads – of three dyads. As for the role of the "first impulse" that compells the atoms to combine into these "molecules" it is played by the abovesaid *adṛṣṭas.* Thus, during the *sṛṣṭi* the physical universe is created according to a certain moral and religious design kept and carried on by the *adṛṣṭas* through the time of *pralaya* (a cosmic night). The role of Īśvara, in the final analysis, is like that of the *Demiourgos* in Plato's *Timeus;* as for the *adṛṣṭas*, they may be compared to the *eidos,* the original paradigm that serves the Demiourgos as a model of creation.

4. The origination of duality (dvitva)

Having all this in mind, we turn now to Praśastapāda's explanation of the mental process of producing duality (*dvitva*) which is of crucial importance in his treatment of numbers. Thus, we will make a certain turn from the Vaiśeṣika metaphysics to its, so to say, psychology of thinking. It is highly probable that Praśastapāda's exceptional interest in the atomization of mental phenomena and of their respective counterparts in reality is due to Buddhist influence, especially to their manner of placing mental acts and their objects side by side in their classifications of dharmas like that of *dhātu*, *āyatana* etc.[33].

Praśastapāda maintains that plural number (*aneka*) *is* produced from many "onenesses" with the help of the *apekṣābuddhi* and is destroyed with the destruction of the latter[34]. The process of producing the duality (*dvitva*) as a model for the arising of all the other plural numbers is divided by Praśastapāda into eight stages:

33 J. Bronkhorst even thinks that the Vaiśeṣika is a kind of reaction to the Buddhist school of Sarvāstivāda. See: J. Bronkhorst. Quelques axiomes du Vaiśeṣika. – In: *Les Cahiers de Philosophie. L'Orient de la pensée. Philosophies en Inde.* N 14, 1992, p. 108-109.

34 *tasyāḥ khalv ekatvebhyo'nekaviṣayabuddhisahitebhyo niṣpattir apekṣābuddhivināśād vināśa iti* / PB p. 74.

I. The eye of an agent is in direct contact (*sannikarṣa*) with two [the idea of two is expressed grammatically by the dual] objects – either similar or dissimilar – endowed with "oneness". In the result of this contact there arises a cognition of the genus *ekatva* ("oneness")[35];

[This passage might suggest a response to those who having read some modern books on the history of number theory could come to the conclusion that the Vaiśeṣika concept of numbers as attributes was nothing but a representation of primitive thinking where numbers were not yet abstracted from concrete things[36]. Contrary to this, we find in Vaiśeṣika a *genus,* or generality, of number "one" – the "oneness". Is it the result of abstraction of concrete properties from concrete things, or is it a universal that is *a priori* given but not generated by our conceptualizing activities? This question concerns some issues of the Vaiśeṣika realism which are not handled here. So for the moment, we limit ourselves to Karl Potter's brilliant remark that the Nyāya-Vaiśeṣika's proponent "peoples the world with universals rather than attributing classifications merely to our selective attention"[37]].

II. The arising of the *apekṣābuddhi* about two qualities "one" with regard to more than one object which is based on the cognition of the genus of "oneness" and its relation with the objects[38] .

III. The arising of the duality from two "onenesses"[39].

IV. The arising of the cognition of the genus "duality" (*dvitva*)[40].

V. The *apekṣābuddhi* (that has arisen at the previous stage) becomes liable to destruction, and simultaneously there arises a *buddhi* of the attribute of "duality"[41].

35 *yadā boddhuś cakṣuṣā samānāsamānajātīyayor dravyayoḥ sannikarṣe sati tatsaṃyukta-samavetasamavetaikatvasāmānyajñānotpattau* / P.B. 74-75.

36 In the writings about the history of number, one can often read that in primitive thinking numbers were regarded as attributes which are inseparably bound with the substances they enumerate. Thus, for example in the *Dictionary of the History of Ideas* where we come across the following passage: "One of the main insights one gains from a comparative study of number words in various languages, particulary those of primitive people, is the fact that in the early stages of counting numbers have much in common with adjectives. That is to say, numbers are seen in very close relation with the object they count" (*Dictionary of the History of Ideas. Studies of Pivotal Ideas.* Ed. in Chief Philip P. Wiener, vol II, Charles Cribner's sons, New York, 1973, p. 403).

37 *Indian Metaphysics and Epistemology,* p. 133.

38 *tatsambandhajñānebhya ekaguṇayor anekaviṣayiṇy ekā buddhir utpadyate* / PB p. 75.

39 *tadā tāmapekṣyaikatvābhyāṃ svāśrayayor dvitvam ārabhyate* / PB. p. 76.

40 *tataḥ punastasmin dvitvasāmānyajñānam utpadyate* PB p. 76.

41 *tasmād dvitvasāmānyajñānād apekṣābuddher vinaçyattā dvitvasāmānyatatsambandhatajjñānebhyo dvitvaguṇabuddher utpadyamānatety ekaḥ kālaḥ* / PB p. 76.

VI. the destruction of this *apekṣābuddhi* and as a result of it the *apekṣā-buddhi* of the attribute also becomes liable to destruction. At the same time there arises a *buddhi* of the substance expressed in the words "in two substances"[42].

VII. The destruction of the duality and the beginning of the destruction of the attribute "duality". At the same time the arising of the *saṃskāras,* or mental traces in memory[43].

VIII. The destruction of the attribute "duality" and of the *buddhi* of the substance. There rest only *saṃskāras.* In other words, this process has produced traces in memory[44].

In the same manner, there arise the other plural numbers like "threeness" (*tritva*) etc.

The whole process has the following sequence: from the direct contact of the sense-organs with two objects[45] there arises a concept of "oneness" as something that is common to these two objects, whether they are similar or different. Thus the idea that a thing is one, or as the Vaiśeṣika puts it, that a thing posseses "oneness", may come to mind only in the situation when there is more than one thing in contact with our sense-organs. Does it mean that a singular object may be cognised as being "one" only if compared with something else? Here, we again encounter an example of the "dialectics of one and many" when "one" cannot exist and be cognized without a related idea of many.

But the "crucial events" seem to be those of the second and the third stages, where the arising of duality as a "real" factor is explainded to be the result of simultaneous cognition of two qualities of "one", or *apekṣābuddhi* (the idea of "two" is expressed by sheer grammatical means – *ekaguṇayor* or by grammatical dual number), and thus the cognition of the particular quality "one" is based on the cognition of the universal quality "oneness", or universal of "oneness", which, according to Praśastapāda, is similarly directly cognized in the object itself. It follows from above, as we may well suggest, that the "objectivity" of the "twoness" is based on the objective reality of "oneness".

42 *tata idānīm apekṣābuddhivināśād dvitvaguṇasya vinaśyattā, dvitvaguṇajñānaṃ dvitva-sāmānyajñānasya vināśakāraṇaṃ dvitvaguṇatajjñānasambandhebhyo dve dravye iti dravyabuddher utpadyamānatety ekaḥ kālaḥ* / PB p. 76.

43 *tadanantaraṃ dve dravye iti dravyajñānasyotpādaḥ dvitvasya vināśaḥ dvitvaguṇa buddher vinaśyattā, dravyajñānāt saṃskārasyotpadyamānatety ekah kālaḥ* / PB p. 77-78.

44 *tadanantaraṃ dravyajñānād dvitvaguṇabuddher vināśo dravyabuddher api saṃskārāt* / PB p. 78.

45 This contact is technically called *saṃyuktasamavetasamaveta,* literally "inherence in something that inheres in something that is conjoined", that is, both onenesses are inherent to their respective *guṇas*, each of which inheres a substance which is in contact with the eye of the perciever.

The logic of the first six stages is determined by Praśastapāda's postulate that the cognition of the qualificator (*viśeṣaṇa*) must be accompanied by the cognition of the qualified (*viśeṣya*). Thus the process of cognition proseeds from *viśeṣaṇa* to *viśeṣya,* from general qualities to particular ones, from attribute to substance. In our example it runs from "oneness" of the two – to two "ones"; from two "onenesses" – to the duality (III); from the duality – to the *genus* of duality (IV); from the *genus* of duality – to the attribute of duality (V); from the attribute of duality – to the substance of duality as the bearer of the quality "twoness".

It is clear that this description, even if related to a cognitive act aiming at establishing the number of something, does not entail any kind of 'one-to-one' correlation between objects and natural numbers, – that is, the correlation that constitutes the process of counting as conceived in Western number theories. Strictly speaking, in Vaiśeṣika there are neither independent objects, nor independent numbers to be correlated one with another – for "two", when it comes to be attached to substance is not already a number "two" (as on the III and IV stages), but a quality "twoness" originated from the *genus* of "twoness". In this respect, it is a generality of generality. One can see a certain kinship of this theory with Russell's and Whitehead's thesis of a number as a set of sets (see below).

The next topic of Praśastapāda's section on number is the destruction of the duality and of the other plural numbers. Since arising and existence of plural numbers, as stated by Praśastapāda, is obliged to the *buddhi* of many substances, its destruction is due to the destruction of the *apekṣābuddhi* in the process of destruction of their substratum. Praśastapāda divides the latter into three stages:

I. The arising of action in one part of the substance, disjunction of this part from the whole; arising of the cognition of the genus "oneness", arising of the *apekṣābuddhi* of the removed part as "one"[46];

II. The destruction of the conjunction of the parts of the substance, the arising of the duality; from destruction of the conjunction there follows the destruction of the substance and arising of the idea of generality[47];

III. From the destruction of the *apekṣābuddhi* to which the idea of the generality is obliged, and from the destruction of the substrate there follows the destruction of the duality[48].

46 *yadaikatvādhārāvayave karmotpadyate tadaivaikatvasāmānyajñānam utpadyate, karmaṇā cāvayavāntarād vibhāgaḥ kriyate, apekṣābuddheś cotpattiḥ* / PB p. 79-80.

47 *tato yasminn eva kāle vibhāgāt saṃyogavināśas tasminn eva kāle dvitvam utpadyate/ saṃyogavināśād dravyavināśaḥ, sāmānyabuddheś cotpattih* / PB p. 80.

48 *tato yasminn eva kāle sāmānyajñānād apekṣābuddher vināśas tasminn eva kāle āśraya-vināśād dvitvavināśa iti* / PB p. 80.

One can distinguish two types of events occurring here: external mechanical events: an action which removes one part of the thing; destruction of the conjunction of the parts of substance, and in parallel, the chain of mental events: *apekṣābuddhi* of the separate part as "one", the rise of the duality, and of the idea of generality; destruction of the duality as a result of the total destruction of the whole, which was regarded as a substrate of the duality (perhaps because the observer looked at it as consisting of two parts).

These series of stages, asserts Praśastapāda, is the only right way to unfold the process of origination and destruction of plural number from the viewpoint of *vadhya ghātaka* (literally "destroying of something to be destroyed") – a conception according to which the arising of each new mental event or cognition destroys the previous one[49]. He distinguishes it from *sahānavasthānalakṣaṇa* – or a theory that explains the impossibility of the co-existence of two different cognitions by the impossibility of their simultaneous staying (*avasthāna*). He asserts that the latter could not explain the arising of the cognition of substance, because the simultaneous destruction of the *apekṣābuddhi* (the reason of the duality) along with the *buddhi* of quality (stages V-IV) with the duality being already destroyed makes the origination of the *buddhi* of substance impossible, because it would not have the productive cause (according to the *vadhya ghātaka*, the cause of the cognition of substance is the cognition of its attributes)[50].

However, the opponent suggests that we may deduce the cognition of the substance from the cognition of its *guṇas,* that is, through inference (*anumāna*), but Praśastapāda rejects such a possibility because it is the case of perception he discusses here, but not inference. Moreover, he deals here with the perception of substance as a *viśeṣya* not to be perceived without a *viśeṣaṇa* (the act of qualification). In connection with this, he refers to Kaṇāda's statement: "The cognition ["It is white"] in respect to a white object, [results] from whiteness of the substance in which combination of whiteness exists, and from the cognition of whiteness. These two [cognition of white object and cognition of whiteness] are related as effect and cause" (VS VIII.I.9)[51]

Further on, Praśastapāda rejects two other possibilities – the first one stands for identifying *viśeṣya* with *viśeṣaṇa* as the subject of inference and the middle term; the second pertains to identifying the *viśeṣya* with *viśeṣaṇa*

49 *śobhanam etad vidhānam vadhyaghātakāpekṣe* / PB p. 80.

50 *guṇabuddhisamakālam apekṣābuddhivināśād dvitvavināśe tadapekṣasya dve dravye iti dravyajñānasyānutpattiprasaṅga iti* / PB p. 80.

51 *samavāyaḥ śvaityāc chvaityabuddheś ca śvete buddhis tu ete kāryakāraṇabhūte* / VS VIII.I.9.

on the ground that they appear so quickly one after another that it is impossible to see in them different stages of cognition. The second case is illustrated by Praśastapāda with the proposition "*ākāśa* is endowed with sound" where, as Śrīdhara comments, one can distinguish three different cognitions following one another: "that of sound, that of *ākāśa* and that of *ākāśa* being qualified by the sound; and similar is the case with the cognition of duality etc. That is to say, just as in the case of cognition of sound etc. in as much as the cognitions follow closely one upon the other, we are unable to perceive any sequence in their appearance, and come to regard them as simultaneous, – in the same manner we have to deal with the case of the cognitions of duality and substance"[52]

But the opponent continues to argue that the same argument may be directed against Praśastapāda's own theory of *vadhya ghātaka.* It may be said that the awareness of substance would not arise, because of the simultaneous arising of *saṃskāras* and of the *genus* duality which comes to destroy the *apekṣābuddhi* (stage VII). To this Praśastapāda answers: "not valid", because the cause of the *saṃskāras* is a collective cognition (*samūhajñāna*) of the substance as qualified by the quality of duality, but not mere perception (stage I) which has been already destroyed by the next stages[53].

The last opponent's objection amounts to the following: if the incompatibility of cognitions consists solely in the fact that one of them destroys the other; in order for one to be able to destroy the other, both must be present. Answering this last objection Praśastapāda refers to the *sūtra* of Kaṇāda where he speaks about the impossibility of the simultaneous cognitions (*jñānayaugapadya*): "From the non-simultaneity of volitions, and from the non-simultaneity of cognitions (it follows that there is only) one (mind) (in each organism)" (VS. III.2.3). So, Kaṇāda justifies the existence of the atomic *manas* by referring to the fact that we cannot have several cognitions at one and the same time. To this argument we will return later. Now it is time to make some comments on Praśastapāda's above reasonings.

One must admit that Praśastapāda's description of the arising, cognition and destruction of duality and the related polemics is without any doubt one of the most difficult topics in Vaiśeṣika studies. But this difficulty, in my opinion, should not be explained away as, say, an example of scholasticism for the sake of scholasticism, for it certainly reflects real problems the Vaiśeṣikas faced while accepting certain metaphysical and epistemological

52 NK p. 264 (tr).

53 *na samūhajñānasya saṃskārahetutvāt – samūhajñānam eva saṃskārakāraṇam nālocanajñānam iti adoṣaḥ* / PB p. 85 and Śrīdhara's comments on it, p. 256 (tr.).

premises. Thus the concept of duality may be regarded as an attempt to reconcile epistemological realism (the "twoness" as a real thing in two substances) with the subjectively charged idea of numbers from two onwards as dependent on *apekṣābuddhi.* The latter, in its turn, ensue from the more fundamental problem – how to account for the transition from metaphysical to physical worlds discussed in the previous chapter.

What interests me with regard to this account, is most of all its "atomistic" inclination. One may notice its striking similarity with the Buddhist theory of *dharmas* and *kṣaṇas.* Like Buddhist *dharmas,* mental and physical events are outlined in this text as passing through three *kṣaṇas* (or moments) of arising, staying and destruction. Though a certain Buddhist influence the Vaiśeṣika is more or less acknowledged, it seems unjustified to reduce the Vaiśeṣika theory of stages exclusively to this influence, and to neglect its own intrinsic premises.

First it must be made clear that unlike the Buddhist theory of *kṣaṇas* that stands for a pure discontinuity of mental phenomena, the Vaiśeṣika's "atomistic mode of thinking" presupposes a certain continuity. According to the Vaiśeṣika, a mind *(manas)* is a moving atom capable of seizing only one ultimately limited piece of "information" in the unit of time. It moves from one sense-organ to another gathering their various data "one by one" and in the same manner, that is "one by one", transmitting them to an *ātman* (a soul, which is the subject of cognition) in a form of a linear succession of the "atomic" cognitions. Thus, the atomicity of *manas* and its capability of conjunction and disjunction with one sense-organ at a time does more or less predetermine the "atomicity" and the momentariness of the cognitive acts. The theory of momentariness of the cognitions, or *vadhya ghātaka*, mentioned above, states each new phase of any mental process to destroy the previous one.

Though *manas* is a kind of atom, it does not exist only during the time of its momentary projections. Like *ātman*, *manas* in the Vaiśeṣika is a continuous substance that provides a continuity of the person's mental life. What is discontinuous, are the cognitive acts produced by *manas* and perceived by *ātman.* In this respect, the Vaiśeṣika's view clearly differs from the Buddhist theory of *dharmas* as well as from the *kṣaṇikavāda* which sharply rejected the existence of any continuous and substantial principle behind the changing mental and physical phenomena.

As to the Vaiśeṣika accent on the destruction of mental events, this might be due not only to Buddhist influence, but to a pure mechanistic view (quite characteristic of the "atomistic mode of thinking") according to which one unit of substance (or atom) may occupy only one unit of place (*pradeśa*) in one unit of time (*kṣaṇa*). In the same manner, every mental event, just like the

atom of substance, might be regarded as something occupying a certain place and time. And as two atoms cannot occupy one place at one and the same time, two cognitions cannot simultaneously be executed by, or be carried on, by the same "atomic" *locus,* or *manas* either.

One more clue to understanding the Vaiśeṣika view on mental phenomena may be found in the other mechanistic theory of the Vaiśeṣikas, that of the *pīlupākavāda.* It states that a colour of a jar born by heating (*pākaja*) arises not in the whole, but in its ultimate components or the atoms (*pīlu*). That is why, in the process of baking, for its new colour to be produced, a jar is destroyed up to the atoms. This mechanistic model was in a way juxtaposed to mental life. Every new emerging cognition being a quality of *ātman* produced with the help of the atomic *manas* has also to replace, or more precisely, to destroy, the existing one. Hence, in the Vaiśeṣika theory of mental life, we can see a certain combination of the purely discontinuous *kṣaṇikavāda* with substantialist mechanistic atomistics based on the principles of selfidentity, and thus of continuity, of the atomic substance in time.

As for the division of thought process into separate and further indivisible stages, it is quite typical for Praśastapāda especially in his treatment of qualities like *saṃyoga-vibhāga* (conjunction-disjunction), *paratva-aparatva* (remoteness-nearness), as well as *pākaja* colour (born by cooking) and some others. One may notice that the occurring of events at each stage is limited to an instant, and is regulated by adverbial modifiers of time like *yasmin kāle – tasmin kāle* (when – then), *tadanantaram* (after that) *ekaḥ-kālaḥ* in one moment), etc. But it seems that Praśastapāda did not take care to fashion one stage as somewhat logically resulting from the previous one. All the *stages* distinguished by Praśastapāda seem to present a purely mechanical sequence of atomic moments that are simply put one after the other without establishing any kind of cause-effect relation between them. This manner of exposition of process is for me another indication of the Vaisésika atomistic mode of thinking which this time is manifested in the *atomization* of thought.

But the most important thing to note is that the explanation of duality referred to above which has primarily served as a justification of the Vaisésika realism (we cannot have a perception of something that does not exist in the external world) in the final analysis runs counter to this very realism. Thus, as we have mentioned above, the duality is considered to be an objective quality for the time of its perception. But following the conception of the *vadhya ghātaka,* at the moment of its cognition the quality of duality is already destroyed by the destruction of its *apekṣābuddhi. As* Śrīdhara asserts: "The destruction of *apekṣābuddhi* becomes the cause of the destruction of duality; as while the former is present the latter is never to exist"[54]. As it

appears from above, external reality may he just a projection of our ideas. D.N. Shastri thinks that the application of the Buddhist theory of the succession of moments leads to "a clear violation of the principle that every perception must have its counterpart in the external world" (146). For him it is a proof that "extreme realism slips into idealism"[55].

Having agreed with Shastri in his appreciation of what he thinks to be a violation of the realistic principle, I could not share his evaluation of the Vaiśeṣika realism as "extreme". Compared with the Western scholastic tradition, Vaiśeṣika realism seems to be "moderate" rather than "extreme". Since it recognized the existence of things along with universals, it could be likened to scholastic conceptualism.

It is very stimulating to ask ourselves why Vaiśeṣika has combined such different orientations as philosophical realism, and at the same time the Buddhist treatment of all mental and material objects as being composed of some units, a position which inevitably has lead the Buddhists to nominalism?

I would like to suggest a kind of a working hypothesis. It seems quite probable that the Vaiśeṣika realism results first and foremost from its fundamental preoccupation *with the conceptual and verbal structure* of "what there is" (using Halbfass's formula for "being"), as contrasted with *transverbal strategy* of higher knowledge proclaimed in such more practically oriented religious systems like Vedānta or Buddhism.

Praśastapāda asserts that all the six categories of the Vaiśeṣika, that is, *dravya* (substance), *guṇa* (quality), *karma* (motion, action), *sāmānya* (general, genus, universal), *viśeṣa* (particular, species), *samavāya* (inherence), are characterized by *astitva* (is-ness), *abhidheyatva* (capability of being expressed in words) and *jñeyatva* (capability of being known). This triple formula when applied to whatever is the subject of Vaiśeṣika thought, appears to have the following implications: *everything existent must be inevitably nameable and cognizable, or, otherwise, everything nameable must be cognizable and existent, and finally, everything cognizable must be nameable and existent.* That is, names and conceptions are said to exist in the same "ontological" tone of voice in which are mentioned their referents in the world. Hence, it is quite natural that the Vaiśeṣikas have much in common with the linguistic tradition of Pānini and Patañjali, though they themselves never openly recognized such a affinity. Terms like *dravya, guṇa, karman,*

54 NK p. 256 (tr.).

55 D.N. Shastri. *Critique of Indian Realism*, p. 146.

sāmānya, viśeṣa were used here with more or less the same meaning as the respective terms of Pāṇini and Patañjali[56].

W. Halbfass has shown that the Vaiśeṣika developed an enumerative approach, or an attempt "to produce a finite and definite list of categories or types of entities"[57]. As for me, I prefer to emphasize the other aspect of the Vaiśeṣika's enterprise: an attempt to find the *final and ultimate constituents of all things*. It might be suggested that the very scheme of the six categories is an outcome of analysis of "what there is", "what may be named" and "what may be cognized" to a set of respective ultimate and irreducible units in the form of categories. This analysis is by no means identical with the purely enumerative or inventary approach which does not necessarily entail the list of categories to be not only "finite and definite", but the most brief and exhaustive either (perhaps, we deal here with the so called "principle of economy" quite caracteristic of Indian grammar with its attempt to describe the totality of linguistic facts by as few grammatical rules as possible). The list, in its turn, is comprising the entities that (like the categories themselves) are also irreducible and ultimate. Karl Potter rightly defines these entities as "*individuals*" (*individual* is a Latin form of the Greek *atom*, or indivisible)[58].

But the essence of the realistic strategy of the Vaiśeṣikas might be connected with their endeavors to understand a class of phenomena not by reducing it to the elements of some other class, as it is usually the case with the explanations by reduction, but by disclosing its constituent causes within this class itself, and ascribing to them this class's final self-identity. It strongly reminds us of the explanation by analogy. But here all characteristic features of things that serve as the bases of analogy are extracted and ontologized.

For instance, the Vaiśeṣika atoms of matter are taken as just miniature copies of their respective elements earth, etc., and, contrary to the atoms of Democrits (who followed a reductional explanation) are endowed with the qualities of these elements. The ultimate constituent of the category of *viśeṣa* is *antya viśeṣa*, "final individuator" that concentrates in itself a minimal "critical mass" of individuation or difference as such. It is also the case of the phenomena that are technically defined as being *sāmānya-viśeṣa*, or having

56 P.S. Filliozat. Comments on Paspaśā. In: *Le Mahābhāṣya de Patañjali avec le Pradīpa de Kaiyaṭa et l'Uddyota de Nāgeṣa. Adhyāya 1, pāda 1, Ahnika 1-4.* Traduction par Pierre Filliozat, Pondichéry 1975, p. 1-143.

57 W. Halbfass. *On Being and What there is*; p. 229-234.

58 *Indian Metaphysics and Epistemology. The Tradition of Nyaya-Vaisesika up to Gangesa.* Ed. by Karl Potter, p. 49.

generalities and species, with the exception of unitary substances like *ākāśa*, time and direction (*dik*).

In the same line, we may suggest that Vaiśeṣika universals can be also viewed as ontologized derivations from the explanation by analogy (notwithstanding the explanations the Vaiśeṣika themselves have given to the phenomenon of universals). For instance, according to the Vaiśeṣika, we can perceive a cow, because of the "cowness" residing in this animal that enables us to identify our object of cognition as a "cow ". It is easy to see that this strategy is productive of many entities in the universe, and it is not surprising that even the absence of something has been ontologized as a special entity (*abhāva*).

This fundamentally pluralistic and discontinualistic approach of Vaiśeṣika realism is quite in tune with what I have called the "atomistic mode of thinking". It is namely this that seems to make the Vaiśeṣika quite receptive to the Buddhist discontinuous schemes of reality (inspite of the fact that the latter have been, in my opinion, the result of another, reductional type of explanation).

The same goes for the phenomenon of numbers. Our authors seem to held that since we have words for numbers there has to be something in the external reality to correspond to them, and as in ordinary usage numbers are always associated with something we count or enumerate, they should be categorized as attributes of certain *substrata*. As for their grammatical usage, it may be said that in Sanskrit the number concept has merged with the noun (including adjectives) to make special grammatical forms, where, as in Greek, besides the singular and the plural there exist the dual. Among the cardinals only "one" (*eka*) is following the declension of the pronominal adjectives like *sarva*, the other numbers up to 19 are declined like adjectives. It is held that all numbers from 1 - 19 are syntactically equivalent to adjectives, the rest are used as substantives[59]. Thus the predicative nature of number has its correlative grammatical structures.

Uddyotakara, Śrīdhara[60], Vācaspatimiśra took pains to establish the objective reality of numbers in debates with the Buddhists. Their arguments were based on the reasoning that the cognition of "one" and "many" is different from the cognition of a jar etc., so its cause must be other than the cause of colour or other perceptible qualities of the jar. That is why they argued the independent reality of numbers as qualities to be postulated[61].

59 Cf. J. Wackernagel, Altindische Grammatik. Band 3, Göttingen, 1930, p. 329-430.

60 NK, p. 62.

61 D.N. Shastri, *Critique of Indian Realism,* p. 293-294.

A word remains to be said about possible modern parallels of the Vaiśeṣika number theory. Some Western philosophers and logicians have come to the somehow similar conclusion that number should be defined as property – a property of a set, or as Russell put it, "A number is anything which is the number of some class"[62]. If we return to Praśastapāda's description of the duality production we may easily see that "two" is not a natural number, but a *genus,* and it is this very *genus* where the number-attribute does spring from (stages IV-V). It is symptomatic that these thinkers produced such ideas, while carefully trying to establish a sure and safe logical ground for number theory. Perhaps the same may be said about our Vaiśeṣikas, with the reservation that they were eager to establish a sure logical foundation not only for numbers, but for everything?

The Vaiśeṣika theory of numbers and mathematics

Finally, in what remains, I draw some conclusions from my comparison of the Vaiśeṣika philosophy of number with that of Pythagoras and its followers. The latter, as I have already mentioned, developed the substantial philosophy of number (I will treat a word "substance" in its literal sense as "that, which lies under something being its base"). Following the substantial approach, numbers are held to be originators, primary entities that constitute the basis of all things. Therefore they make up an independent and self-sufficient reality or "intelligible matter". All perceptible and intelligible objects (that is, things and notions) are brought about by numbers and are dependent on them. The Pythagorean and Platonist traditions come to their culmination in Plotinus' philosophy of number. The most important contribution this tradition has made is the recognition of a kind of independent mathematical reality. The analysis of this reality has revealed the principal difference between even and uneven, simple and complex, rational and irrational numbers etc. As numbers were extracted from things they became an object of free intellectual manipulations. Thus through a study of the interrelations between numbers, the discovery of the proportions etc. has been made. The fundamental belief that the book of nature is written in the language of mathematics contributed much to the development of European science. It is not surprising that even now one of the most authoritative trends in the modern number theory is called platonism.

62 B. Russell. *Introduction to Mathematical Philosophy.* London: G. Allen and Unwin, LTP, New York 1919, p. 19.

Though the Indian tradition knew a lot of numerical complexes like three *guṇas* (*rajas, tamas, sattva*) *trimūrti,* four noble truths, four *puruṣārtha* (goals of man) and so on, the numbers used in them were never considered apart from what they enumerate. As W. Halbfass has shown in his book "On being and what there is", the Indians were very much preoccupied with enumeration[63]. As for Indian mathematics (and astronomy closely related to it), its outstanding achievements[64], it seems, were not inspired by rational, mystical or religious philosophy whatever, but as a matter of fact, resulted from the primarily practical task of establishing formal rules for the right execution of religious ceremonies including the construction of sacrificial altars and other religious objects, as well as the reckoning of the right time for these procedures. The interest in numbers revealed by the Jaina philosophers is also connected with some practical religious needs as well as with their cosmographical constructions. This explains the development of special Jaina mathematics to be quite independent from their philosophy.

As the Vaiśeṣika conception of numbers is concerned, I argue that it is exactly this very identification of numbers with quality and not with substance, that predetermined their purely subservient and instrumental role. Being subjected to a concrete *substratum* numbers could never soar over the world of things and become an object of free intellectual manipulations. Thus, as it follows from above, numbers in Vaiśeṣika always exist not by themselves, but only *through the other* and *for the other.* This "other" is the ontological and epistemological frameworks were numbers were subservient to the substance they were attributes of. The knowledge of numbers cannot reveal any mysteries of the world. The lack of piety towards them, or in other terms, the absence of the accentuated soteriological dimension made the Vaiśeṣika numbers conception a sort of purely scholastic and speculative one. It is no wonder, that unlike the Pythagorean conception in Greece, it has not produced any appreciable intellectual resonance either in Indian mathematics, or in the Indian religious and philosophical tradition.

63 W. Halbfass. *On Being and what there is*, p. 38.

64 The discovery of the decimal place-value concept and notation, in geometry the discovery of incommensurability of diagonal of a square and its side, and as a result, a conception of irrrational number and determination of their approximate value etc. See: chapters on Mathematics in: *A Concise History of Science in India*; Debiprasad Chattopadhyaya. *History of Science and Technology in Ancient India. The Beginnings.* Calcutta, 1986; *Studies in the History of Science in India. Ed. by Debiprasad Chattopadhyaya.* Vol. II, New Delhi, 1982.