PUBLISHER'S NOTE

It is our privileged pleasure to express our sincere gratitude to Shri Yashvant Kumar Jain, Raipur, who has financed the publication of this volume in sacred and cherished memory of his late father, Shri Vijay Kumar Jain, Sagar.

Professor L.C. Jain operated three projects at the instance of the Indian National Science Academy from 1984 to 1996, on the History of Science in India. We have already published his third project, edited as "Exact Sciences in the Karma Antiquity" in four volumes, with collaboration of Dr. Prabha Jain on "no profit no loss" basis. Now his first project is being published in part as "Mathematical Sciences in the Karma Antiquity" duely compiled by Dr. Prabha Jain, in two volumes out of which this is the first volume, the second one is in press.

A research publication is a hard nut to crack, as the scholars are only a few, in the beginning, interested in this new branch of study. It is on the Mathematicosymbolic Karma System Theory on which about forty-five large volumes in Prakrit and Sanskrit are available. Due to its treatment through an abstruse unified theory of Karmic interactions between bios and matter, this study has a history of individual scholars, mainly preceptors, from the initiated Mauryan Emperor Chandragupta, through a gap of about two hundred years as said to have been in each of their works. The last of them was Pandit Ṭoḍaramala of Jaipur (1721-1761?) who had to sacrifire his life, as a victim to a conspiracy against his works. About two centuries after him, professor L.C. Jain took up this study in a modern updated form through INSA projects which we are publishing gradually and slowly.

We acknowledge the keen interest taken by Shri Nirmal Kumar Sethi, Chairman, SBDJ, Mahasabha, New Delhi; Shri Ajit Kumar Singh Kasliwal, the chairman of Kundakund Gyan Pith, Indore; Shri Jinaraj Jain, Paper Udyoga, Delhi and Dr. Anupam Jain who moved us for this arduous task. We should like to express our hearty gratitude to professor Dr. Peter Flügel, University of London, for his fervour and deep concern in our INSA project editions. We are obliged to him for his prologue.

Thanks are due to the Up-to-Date Print Media, Jabalpur, particularly to Shri Rajesh Kumar Jain, the proprietor, for their meticulous care and interest.

It is hoped that the institutions and individual scholars will take the benefit of our unprecedented publications of these INSA projects for probing deep into the still veiled mysteries of the non-violent culture of India.

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PROLOGUE

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Doctrines of karman occupy the space between natural and moral philosophy. They mediate between determinism and free will. Tensions between the two principal components of karman theory, a deterministic philosophy of nature or karmic causality and intention-based ethics, are in evidence throughout the history of Indian philosophy.[1] In Jaina philosophical texts, expounding the most sophisticated deliberations on karman, the word karman, action, is also used in different ways. Historically, Jaina karman theory seems to have developed from a voluntaristic theory of action, concerned with the relationship between subjective choices and objective consequences of action for both subject and object, to a system theory of the working of karman, conceived from an entirely objective, quasi-scientific, point of view. Here, the word karman designates both an objective process and its result, karmic matter or *karman pudgala*, the seed for renewed action of the same kind. In modern bio-cybernetic terms, the system theory of karman can be interpreted as a boundary maintaining mechanism, governed by an internal control-hierarchy. In the Jaina case, the constitutive goals of the control-hierarchy of the karmic system are not individual preferences, but scripted religio-cultural values. The difference between the voluntaristic and the system theoretical approach is significant. A system does not act. It functions. Ethical considerations, concerning right and wrong conduct, are external to the system theory of karman which describes the inner working of karma in purely theoretical terms.

The earliest surviving Jaina texts on karman, the 'Seniors' among the Śvetāmbara Āgama texts, generally dated fourth or third century B.C.E., are concerned exclusively with ethics, while later Digambara and Śvetāmbara texts of from the beginning of the first millennium C.E. abound with cosmological speculation and technical philosophical and mathematical detail.[2] The first fully-developed system theories of karman are in evidence in the Digambara "Siddhānta" and in rudimentary form already in late-canonical Śvetāmbara scriptures, such as Samavāya, Viyāhapannatti, and Ārya Śyāma's (c. 79 B.C.E.) Paṇṇavaṇā, whose contents overlap in parts with the much more elaborated Ṣaṭkhaṇḍāgama of the Digambaras Puṣpadanta and Bhūtabali (c. 100-200 C.E.) as MĀLVAṆIYĀ (1971: 223-231) showed.[3] The later karma-theoretical works of the Digambaras[4] and the

1. Wilhelm HALBFASS 1991/1992: 294 summed up the principal theoretical issues in karma theory: 'There are symptomatic "grey zones," questions and ambiguities concerning the scope and limits of karmic causality. It is by no means simply taken for granted that the whole world is just a stage for ethically committed or soteriologically meaningful events, or that natural processes are necessarily governed by or subordinate to retributive causality. The realm of cosmology and even that of biology is not *eo ipso* coextensive with the realm of saṃsāra, that is, of retribution and of possible soteriological progression. There are various ways of specifying and delimiting karma and saṃsāra and of relating karmic causality to other contexts of causality. ... In its various contexts and applications, it has at least three basically different functions and dimensions: karma is (1) a principle of causal explanation (of factual occurrences); (2) a guideline of ethical orientation; (3) the counterpart and stepping-stone of final liberation. These three functions are balanced, reconciled, and integrated in various manners; they do not form a simple and unquestioned unity'.
2. 'There are two schools in particular who are opposing one another on many by-issues: the Āgamikas and the Kārmagranthikas' (GLASENAPP 1915/1942: xvi).
3. "One thing is certain that the system of exposition through *anuyogadvāras* which we find in several parts of Ṣaṭkhaṇḍāgama clearly follows the system of exposition demonstrated in *Anuyogadvārasūtra*. Nothing of this sort is found in *Prajñāpanā*. This fact indisputably proves *Prajñāpanā* to be older than *Ṣaṭkhaṇḍāgama*" (MĀLVAṆIYĀ 1971: 231). That Digambara authors as late as NEMICANDRA (10th Century C.E.) frequently cite Śvetāmbara texts has been demonstrated by FUJINAGA 2007, who pointed out that the rejection of the 'authenticity' of the Śvetāmbara canon, whose origins are obscure, seems not in evidence in early Digambara literature.
4. See infra.

Śvetāmbara works Kammapayaḍi (Karmaprakṛti) of Śivaśarmasūri, Paṃcasaṃgaha (Pañcasaṃgraha) of Candrarṣi Mahattara, and the Karmagranthas of the thirteenth century Devendrasūri, all composed in Prakrit, are largely predicated on these earlier scriptures, albeit more systematic with new details added in particular on the mechanisms underlying the guṇaṭṭhāṇas (guṇasthāna) and their mathematical quantification, apparently imported from named, now lost, Puvva (Pūrva) texts such as the Kasāyapāhuḍa (Kaṣāyaprābhṛta). Both Śvetāmbara and Digambara texts containing system theoretical approaches of karman claim to be based on the Pūrvas, the reportedly oldest and hence most authentic Jaina texts, or on parts thereof, such as the lost twelfth Aṅga, the Diṭṭhivāya (Dṛṣṭivāda). Because some of the concepts elaborated by the later Karmagranthas are already in evidence in the canonical compilations,[5] SCHUBRING (1935/2000: 74-6, 187, 322) was tentatively prepared to consider the possibility of the existence of an extinct common source, while ALSDORF (1973: 2) remained "not convinced", because "in contents and style, they are typical products of later scholasticism, far removed from the much simpler language and spirit of the old canonical texts".

How can a theory of action, combining subjective and objective perspectives, moral and causal constraints, and a system theory, privileging the observer's perspective, be integrated without contradiction? A glance at the transition from action-theory to general systems theory in modern sociology illustrates the problem. Originally, action was conceived as a teleological means-ends relationship, oriented toward the realisation of a value chosen by a competent agent. To circumvent the subjectivism underpinning this conception, which does not account for the internalised norms and values orienting individual action, Talcott PARSONS created a model of action as a boundary maintaining system, perceived from an observer's rather than an agent's point of view. He argued that a single action, the elementary unit of an action system, can be analysed as a functional system combining four variables.[6] That is, every action can be conceived as a system formed by the interplay of the four components or functions: values, norms, aims and resources. The action system, construed in this way, is but a special case of a living system, with norms and values integrated as functional sub-systems, rather than overarching controls. This model and PARSONS' subsequent cybernetic system theory of action opened new ways of thinking about elementary actions and combinations of actions, social systems, without prejudicing the ontological question of what an action IS, and where it begins and ends:

'Just as the units of a mechanical system in the classical sense, particles, can be defined only in terms of their properties, mass, velocity, location in space, direction of motion, etc., so the units of action systems also have certain basic properties without which it is not possible to conceive of the unit as "existing". ...
It should be noted that the sense in which the unit act is here spoken of as an existent entity is not that of concrete spatiality or otherwise separate existence, but of conceivability as a unit in terms of a frame of reference' (PARSONS 1949 I: 43f.).

Critics of cybernetic theories of action, such as HABERMAS, pointed to the problem that the system perspective abstracts from the agent of action altogether:

'In the concept of an action system, actors disappear as acting subjects; they are abstracted into units to which the decisions and thus the effects of action are attributed. In so far as actions are viewed in terms of their internal analytical structure and conceived of as the outcome of a complex joint operation among the specific subsystems, actors are merely circumscribed by the places they can occupy - in each instance under different aspects - in the four subsystems' (HABERMAS 1981/1987: 235).

Because instrumentalist and structural-functionalist perspectives cannot be integrated in a seamless theoretical whole without reducing one to the other, HABERMAS argued, the variation of viewpoints is the only viable solution. His proposition to systematically vary actor and system perspectives was chided as 'eclecticism' by critics.[7] Yet, it is interesting to note that ancient Jaina philosophers reacted in a similar way to comparable

5. SCHUBRING 1935/2000: 176f., 187f., 320-3.

6. The model is known as the AGIL paradigm. The four functions or sub-systems are: A = Adaptation to the environment (economy), G = Goal attainment (politics), I = Integration (norms), L = Latent pattern maintenance (values).

7. BOURDIEU's 1980/1990 notion of *habitus*, which he somewhere in his later writings compares with karman, also combine two perspectives, but ultimately privileges the system perspective.

theoretical problems. In response to the conundrum of integrating proto-scientific karman-theoretical explanations of the objective functioning of the cosmos (Karman Theory B) with earlier subject- rather than karma-centred soteriologies (Karman Theory A), Jaina philosophers developed a distinct perspectivist epistemology (anekāntavāda) and logic (syādvāda).[8]

The comparison of Jaina karman theories with modern sociological theories of action and social systems sharpens the eye for the idiosyncracies and the blind spots of both approaches. The most striking formal similarity is that both the developed Jaina karman theory and social theory break with ordinary common sense perception by positing the real or theoretical existence of unobservable entities and processes as explanations for the changes in the phenomenal world. In this sense, both models are essentially theoretical. Yet, they are predicated on different ontologies. Social theory and karman theory explain different phenomena, or rather different aspects of the same phenomenon (action or systems of action). Jaina thinkers are not concerned with the opposition of individual and society, nor with social ontology or social theory. They are interested in exploring the opposition of jīva and ajīva, and their modes of interaction,[9] to build up a model of the shared components and mechanisms determining the fate of the individual soul and the cosmos. The sociological quest of explaining the mechanisms underlying the coordination of actions of more than one individual was never addressed in Jaina literature which generally privileges a subject- or soul-centred perspective. Given its premises are: Karman accrues exclusively to the individual. It can not be transferred or shared. The individual soul alone is responsible for its own karmic fate. From this perspective, social action appears to be at best a source of problems. Social interaction is fraught with danger for the individual, something to be renounced if at all possible. According to Max WEBER (1922/1972: 11), "action is social insofar as ... it takes account of the behaviour of others and is thereby oriented in its course." Because it is oriented towards the sensitivities of others, Jaina karman theory is also a theory of social action, albeit a one-dimensional one, a negative social theory, exclusively focussing on the avoidance of injury of others and hence of one-self. Jaina karman theory considers the existence and behaviour of others, even of animals and plants, but only indirectly under the aspect of non-violence, not from the point of view of cooperation; despite the often invoked *dictum* of Tattvārthasūtra 5.21, parasparopagraho jīvānām, "souls render service to one another,"[10] which modern commentators interpreted either as an import from Hindu scriptures or as an out of place common sense view of Umāsvāti himself.[11]

The main difference between the two approaches is one of ontology and of method. Both instrumentalist and functionalist theories of social action, whether conceived as closed or open systems or as autopoetic systems,[12] differ from corresponding Jaina perspectives by not taking refuge to metaphysical assumptions such as the 'law of karmic retribution'. Reciprocity is not treated as a given but as something to be explained.[13] Jaina doctrines

8. The practical/transcendental opposition is theorised in Jaina philosophical texts in terms of the vyavahāra-naya/niścaya-naya distinction. ALBERT 1991: 126 argued that all double-truth theories are dogmatic 'immunisation strategies': 'Particular viewpoints are introduced that supposedly allow the separation of some problem areas from others, with the intention of eliminating any possibility of criticism from that direction; in short, one applies *dogmatic shielding principles*'.

9. The difficult theoretical question how a spiritual substance can interact with and be bound by a material substance has been addressed in classical Jaina philosophy in terms of doctrines of psycho-physical parallelism and indirect conditioning. See SS vv. 75, 82, 313, etc., on the difference between substantive cause, *upādāna kāraṇa*, and instrumental cause, *nimitta kāraṇa*.

10. Translation by Nathmal Tatia.

11. The *Praśamarati* replaces it with the Āgamic concept of samyaktva-jñāna-cāritra-vīrya-śikṣā' (OHIRA 1982: 61).

12. LUHMANN 1984/1995.

13. See the attempts WUNDT 1874, NIETZSCHE 1887, MAUSS 1925, MEAD 1934, LÉVI-STRAUSS 1950, PARSONS & SMELSER 1956, and LUHMANN 1984.

simply posit the 'law of karman' (*karmavāda*). That is, they assume that both the intended and the unintended consequences of action automatically rebound on the agent exactly proportionate to the degree of violence committed. Yet, they do (and can) not explain its mysterious inner workings. In both the Śvetāmbara and in the Digambara version of Umāsvāti's classical Tattvārthasūtra and in the later Karmagranthas the existence of living beings, the injuring and the injured, is entirely bracketed. Only the objective effect of an action on the acting karmic system itself is described in terms of an abstract feedback mechanism. The solipsistic imagery of the embodied soul's attraction and bondage of further invisible material particles floating throughout the cosmos due to the karmic activity of the passions (*kaṣāya*)[14] contrasts with the focus of the early Āgamic karma theory on (the avoidance of) violence (*ārambha*) committed by a tangible agent in different situations. Yet, despite the existence of two different if not competing interpretations of karman as such in Jaina literature, the karmic law of reciprocity, interpreted in a moral-ontological sense, is nowhere put forward as a model whose explanatory power is to be tested and refined by a process of falsification. It is taken as a given mechanism *in re* which can be dogmatically projected or inferred but not rationally understood by non-omniscient beings, as GLASENAPP (1915/1942: xix) pointed out:

"The task of the Karmagranthas is to expose completely a dogma but not to prove it. That is why we find in them a full enumeration of the different kinds of the *karman*, of the states of the soul, the degrees of their development, etc., but we do not hear why any of this is thus and not otherwise."

Jaina karman theory was not designed to address social phenomena. What about natural or cosmological phenomena? To what extent is Jain karman theory compatible with the modern natural sciences? Johannes BRONKHORST (2000) produced one of very few studies addressing the question of the relationship between teleological and non-teleological, i.e. naturalistic, karman theoretical explanations of the world. He noticed similar tendencies in the history of modern science and in the history of Indian philosophy to move away from teleological explanations to non-teleological explanations:

'Indian thinkers were confronted with essentially the same problem, and were at times ready to take drastic steps in order to arrive at explanations of processes which at first sight seem to be goal-oriented in non-teleological terms' (ibid., p. 122).

With regard to Jainism, he came to the conclusion that, in contrast to the non-dualistic philosophical systems of Hinduism, arguing that the world at large is determined by the collective actions of all its inhabitants, in Jaina philosophy (and to some extent in Sāṃkhya and Yoga philosophy) 'the working of karma is confined to the soul to which it sticks. Other occurrences in the world have to be explained through other causal processes." In Jaina karma theory "None of the eight kinds of karma ... is claimed to have an effect on the world at large, and none have an effect on the creation of the world' (ibid., p. 119). In contrast to Śaṅkara, for instance, classical Jaina cosmology distinguishes between purely physical forms of causality, such as attraction and repulsion of atoms, and karmic forms of causality, Yet, because most tangible entities, including the elements, are conceived as living beings, that is, as composites of a soul and karmic matter, from a Jain point of view, the object of modern natural sciences, dead matter, can hardly ever be experienced, except for a short period after an act of killing. The Jain concept of pure matter (*pudgala*) is for all conventional analytical purposes a theoretical concept, a limiting case, as much as the notion of the pure soul. During their creative period, almost two millennia ago, the Jain life-sciences were preoccupied with the classification and analysis of the empirical world of living beings, which is the world of karman, conceived from the perspective of Karman Theory B. Yet, the constitutive Jaina problematic of the fundamental ontological dualism and the resulting question of how spirit and matter can interact through the mysterious workings of the law of karman are not explained by Jain thinkers, but accepted qua belief in the supernatural insight (*kevala jñāna*) of the Jinas.[15]

14. 'Because of its passions, the soul attracts and assimilates the material particles of karmic bondage' (TS 8.2, cf. 8.24/8.25). It is not precisely that 'Karmic matter is said to be found "floating free" in every part of occupied space (JAINI 1979: 112), but fine matter capable of being transformed into karmic matter (*karmaṇo yogyān pudgalān*) (personal communication P.S. JAINI, March 2008).

15. See also HALBFASS 1991/1992: 297.

From a modern scientific perspective, predicated as it is on the diremption of nature and culture, both early and classical Jaina models of karman merge natural philosophical and moral considerations in an unclear way. Probably the closest analogy of Jaina karma theory in modern (life) science is the theory of genetic modification. But modern science has still a long way to go until phenomena as subtle as those theorised by the ancient Jaina philosophers can be addressed in a methodical way. Rather than merely associating ancient Jaina conceptions metaphorically with the jargon of modern science, Yuvācārya MAHĀPRAJÑA (1992) and Jethalal ZAVERI and his son Muni MAHENDRA KUMAR (1991, 1992) pointed out at least some tentative ways in which a theory of karma that is compatible with natural scientific methods could be developed experimentally in a creative way.[16]

To explain how the act of killing effects the killer, early Jaina texts recurred to popular hydraulic metaphors of invisible moral fluids, conceived as physical substrates, flowing in and out of the embodied souls, as Hermann JACOBI (1914: 468, etc.) and others observed.[17] Two disciples of Dalsukh MĀLVANIYĀ, Krishna Kumar DIXIT (1973: 6), who commented on Viyāhapannatti (Viy.) 1.8.68 [91b], and Suzuko OHIRA (1994: 5-8), who commented on Āyāra 1.3.2.3 and Sūyagaḍa (Sūy.) 1.1.1.3 and 1.10.21, argued that, historically, the Jaina notion of karman emerged from the concept of revenge, *vera* (Skt. vaira, from *vīra*),[18] of which it is but an objectified form.[19] In the earliest strata of the Āyāra and Sūyagaḍa, and in the Viyāhapannatti, the word *vera* seems to be used to designate the 'energy discharged by a victim's soul' in form of a stream, *soya* (Skt. srota) (AS 1.3.4.143f.).[20] The word *soya* is rarely used in later texts. In Viy. 1.8.2 [91b], the expression vereṇaṃa puṭṭhe,

16. The theory is based on the hypothesis that a 'karmic' purification, a psycho-physical self-transformation, can be achieved via the meditative stimulation of hormones which in turn act on the physiology of the body including the constitutive genes. A somewhat similar scientific approach led to the discovery of the experimentally successful Weber-Fechner-Law, the foundation of Gustav Theodor FECHNER's (1860) theory of psycho-physical parallelism ('In order that the intensity of a sensation may increase in arithmetical progression, the stimulus must increase in geometrical progression'). The approach stimulated Wilhelm WUNDT's (1863, 1874) work, which was also influential on modern social psychology and social behaviourism. The Jainologist Ernst LEUMANN (1889) published an early Yoga inspired scientific paper on 'The activities of the soul and its relationship to blood circulation and breathing' in Wilhelm WUNDT's journal.

17. Another example for the conception of invisible moral fluids in Jaina texts cited by JACOBI 1914: 468 are the unique Jaina concepts of *dharma* and *adharma*, medium of motion and medium of rest: 'For, as their names *dharma and adharma* indicate, they seem to have denoted in primitive speculation, those invisible "fluids" which by contact cause sin and merit. The Jains, using for the latter notions the terms *pāpa* and *puṇya*, were free to use the current names of those "fluids" in a new sense not known to other Indian thinkers.' JACOBI's view of early Jaina doctrine as founded on popular 'animism' was reiterated by SCHUBRING 1935/2000: 14f., and others. On 'moral fluids' in contemporary popular Hindu imagination, see for instance MARRIOTT 1991 and DANIELS 1987.

18. See also the explanation of the concept of soul-energy, *vīriya*, in Viy. 1.8.3 [94a].

19. 'Likewise, the primitive populace seem to have believed that any intentional violence committed to a victim is retributed by his *vaira* (revenge, hostility and anger, etc.) which catches hold of the assailant until his due revenge is fulfilled. *Vaira* is the efficacy of the retribution which will hit and bind an assailant without fail, and will not abate until due fruition is achieved. When looked at from the side of an assailant, *vaira* is the sin that he committed by his own self. And sins were considered in the old days as something material which could be cleansed by water or burnt up by fire' (OHIRA 1994: 5f.). See also SCHMITHAUSEN 2000a, 2000b (I am grateful to Prof. W. Bollée for this reference).

20. For salient passages see PISCHEL 1900/1999 § 61: 70. '*Atipāta-srota* probably means that *vaira* is emitted by a victim upon his slaughter in the form of a stream, and *ādāna-srota* probably signifies that the slaughterer receives the emitted *vaira*' (OHIRA 1994: 7). Instead of *soya* (Skt. *srota*), the term *āsava* (Skt. *āsrava*) is later used to designate the 'inflow' of karman. Cf. DIXIT 1973: 6.

'being touched by the revenge' of the victim, is used.[21] In Uttarajjhayaṇa 4.2, and 6.7 and Dasaveyāliya 9.3.7, the word *vera* is employed more in the ordinary sense of hostility and anger, not in the sense of retribution. In the early sections of the same two texts, the word *kamma* (Skt. *karman*) is understood as karmic matter (*kamma puggala, Skt. karma pudgala*), rather than as action in general, as in Ācāra I.[22] It is worthwhile citing DIXIT's (1973: 5f.) speculative reconstruction of the evolution of the early Jaina karman theory at length:

'The Bhagavaī treatment of the problems of karma-doctrine has its own value. In this connection a peculiar verbal usage of the text deserves notice. Thus when it intends to say that a person commits a *kriyā* (*kriyām karoti*) it sometimes says that this person is touched by this *kriyā* (*kriyayā spṛṣṭaḥ*) [91b]. Certainly, the phrase "touched by *kriyā*" used here is somewhat odd but it seems to have been patterned after a popular phrase of those times. For in the dialogue considering the case of one person killing an animal and another person killing this person himself we are told that the first person is touched by the enmity of the animal (*miga-vaireṇa spṛṣṭaḥ*), the second person touched by the enmity of the first person (*puruṣa-vaireṇa spṛṣṭaḥ*) [91b]. Now the modern anthropologists tell us of the primitive people who believe that when a person commits a crime against another person this crime hounds the first person as long as it does not bring upon him an appropriate disaster. And in all probability such a belief was prevalent among that circle of Indian populace which was accustomed to the phrase "touched by the enmity of so and so". This in turn became the starting point for the Jaina authors developing their doctrine of *karma* which in its essence is but a refined version of the belief in question. The first step in this connection must have been to speak of the technical concept "*kriyā*" instead of the popular concept "*vaira*". Then the idea must have occurred to those Jainas that if *kriyā* is to touch a person it must be something tangible, and thus came into existence the concept of *kriyā* treated as a physical entity. Soon, however, *kriyā* qua a physical entity came to be designated *karma* and one began to speak of a person committing a *karma* (*karma karoti*) or a person being touched by a *karma* (*karma spṛṣṭaḥ*). Lastly, the search was made for an active voice usage expressing the same idea as "*karmaṇā spṛṣṭaḥ*", and the phrase "*karma badhnāti*" (binds down a karma) was the outcome.

Here we reach the stage represented by the classical Jaina authors who in this connection exclusively employed the phrase "*karma badhnāti*". But the noteworthy thing is that in *Bhagavatī* the phrase "*karma badhnāti*" is a relatively rare occurrence; for here the moral usual phrase is *karma* (or *kriyām*) *karoti* (or *prakaroti*) [*prakaroti*: 51b, *karoti*: 52a, 52b, 63b, 79a], occasionally *karmaṇā* (or *kriyayā*) *spṛṣṭaḥ*) [91b]. All this makes it sufficiently clear that in *Bhagavatī* what we here having before out eyes are the beginnings of the specific Jaina version of the doctrine of *karma* - of which version there was little trace in the oldest texts.'

Suzuko OHIRA (1994: 5-8) subsequently argued that the word *vera* was used in the sense of 'revenge' already in Āyāra 1.3.2.3 [23] and Sūyagaḍa (Sūy.) 1.1.1.3 and 1.10.21, but ceased to be used in later texts. She speculated that the *vaira* theory was taught by Pārśva and then transformed by Mahāvīra into the *karmavāda* doctrine evident in AS 1.[24] Klaus BRUHN (1993 II: 48) noted, in sum, that the Jaina theory of karman is 'neither a consiste whole nor a concept which tries to explain human behaviour in its entirety'. Further, 'we notice not only higl level syncretism, but also the dynamism of popular beliefs and the parallelism of karma and fate';[25] 'in ethic emphasis is sometimes on the act and sometimes on the attitude; finally, Jainism as a whole, oscillates betwee ahiṃsā legalism and *kaṣāya* soteriology' (ibid., p. 21). Jaina karman theory, it is argued, assumed its classic form after interpreting karmic matter in terms of the imported atomistic philosophy of the Vaiśeṣika traditio BRUHN and BUTZENBERGER (1994: iv) summarised the principal features of currently prevalent academ interpretations:

'... If we ignore some very primitive statements we can probably say that there was a clear shift of emphas from popular ethical thought (offence, suffering = atonement, restoration of the original state of the offender) abstract soteriology. The latter term stands in this case not for a doctrine of salvation in its usual sense, but for a esoteric current in Jaina dogmatics which is not merely detailed and technical, but likewise in its basic charact far removed from the common notions about action, retribution, and redemption. The typical "later karma theory" is of course later than the last period of the canon and also later that the Tattvārthasūtra. ... (iii) . 'Presuming quite unspecific assumptions on moral retribution, the development started with explicitly investigatir the nature of this retribution, and with considering it to be a stream of subtle matter afflicting the individual. second major event seems to have been the idea of describing matter according to the latest atomistic theories natural philosophy, and thus being able to explain the otherwise disturbing circumstance that karmic matter invisible: except if they constitute a considerably large conglomeration like a pot, etc. (*ghaṭādikārya*), atoms a invisible (*apratyakṣa*).'

The question, how the rebounding effect of an action on the agent can be explained in other than naturalist moral-ontological terms has hardly been addressed in ancient or modern literature. From the perspective of a individual, a point of departure for a comparative phenomenology of 'guilt', or generalised feeling of 'obligatio may be offered by the Jaina doctrine of *lessā* (Skt. *leśyā*), colouration of the soul, which could be compared, fo instance, with HEIDEGGER's (1927/1962) notion of mood (*Grundstimmung*)[26].

How can momentary actions have consequences even after long intervening periods of time? Wilhel HALBFASS (1992: 300ff.) showed that in the Brāhmaṇic tradition the Pūrvamīmāṃsa concept of *apūrva*, potenc and the Vaiśeṣika concept of the *adṛṣṭa*, unseen, were proposed to explain storable causal potencies which attac to the agent of an (sacrificial) action (*kriyā*), and hence account for the efficacy and power of sacrifices. Accordir to the 'magico-ritualistic world-view' of the mīmāṃsā philosopher Kumārila in his Apūrvādhikaraṇa of th Tantravarttika, the agent is *ātman*, the soul of the sacrificer who pays for the sacrifice, and the positive consequenc of his sacrificial action - the *apūrva* or *dharma* - remain in form of personal dispositions (*saṃskāra*). Śaṅkara lat

21. Mahāvīra replies to Gautamā's question concerning the karmic consequences for a man who beheads another man who is about to kill an animal with an arrow, and who actually kills the animal after his head is severed from his body: *je miyaṃ māreī se miya-vereṇaṃ puṭṭhe / je purisaṃ mareī se purisa-vereṇaṃ puṭṭhe* || (Viy. 1.8.2 [91b]).

22. 'It has already been noted that the word karma in the *Ācāra* I is used in the sense of action in general, and the same generally holds true in the *Sūtrakṛta* I. However, the word karma occurring in the *Uttara* ... and Daśavaikālika very often ... connotes *karmic* matter. The Jainas thus seem to have understood karma in the sense of a concrete material substance, like *rajas* or dust in the late first canonical stage' (OHIRA 1994: 7f.). Cf. Sūyagaḍa 1.2.1.15, 1.2.16, 1.8.7, 1.2.21, Uttarajjhayaṇa 3.11, 4.7, 7.8, 10.3, Dasaveyāliya 3.14, 4.15.21-25, 9.3.15.

23. Cf. Āyāra 1.2.5.5 and JACOBI's 1884: 24 n. 2 remark that *veraṃ vaḍḍhai appaṇo* (translation: 'increases his own unrighteousness') is 'apparently the close of a śloka'.

24. 'MV [Mahāvīra] grasped the old theory [of Pārśva] of *vaira* in the context of the then current theory of *karn* and gave it a new logical outlook. ... In other words, MV systematized the old tenet of Pārśva by integrating th current thoughts, and established an independent sect of the Jainas by advocating the Jainas to be *ātmavād loka-vāda, karma-vāda* and *kriyā-vāda*' (OHIRA 1994: 6).

25. On elements of determinism in Jaina karma theory, see JAINI 1977.

26. One of the few theoretical reconstructions of the genesis of the 'law of reciprocity' in human societies Marcel MAUSS' (1925/1988) still much-discussed Essai sur le don, which analyses the perceived causativ 'power of the gift', or sacrifice, to oblige the receiver to present a return gift, in terms of a reinterpretation DURKHEIM's socio-psychological theory of collective emotions and the theories of WUNDT on the interactic of gestures, using the Maori term of *mana* as an example. An elaboration of MAUSS' theory is Jan HEESTERMAN's (1984) notion of the transcendence of sacrifice through its interiorisation, or self-obligation, process which Max WEBER (1922) called ethicisation; which resonates with Uttarajjhayaṇa 25 on 'the sacrific of sacrifice'. The implications of these approaches are still awaiting further analysis, for instance from the point view of symbolic interactionism and the theory of emotions.

related the non-karmic *apūrva* theory to karman in his Brahmasūtrabhāṣya. In contrast to the Mīmāṃsa tradition, the Vaiśeṣika concepts work within the framework of a karman theory which accounts for both positive and negative consequences not only of sacrifices but of all actions. The classical Vaiśeṣika author Praśastapāda uses the term *adṛṣṭa* to designate *dharma* and *adharma*, merit and demerit. The Jaina perspective rejects the notion of an invisible mystical force (*adṛṣṭa*) altogether, and in the second stage of the development of Jaina karman theory instead posits the notion of invisible karmic matter which attaches itself to and binds the soul, producing certain causal conditions.[27] This is a purely theoretical conception of karman, far removed from its original meaning of the term. In contrast to the observable, more or less violent, actions of an individual, unseen karmic particles and processes of karmic transformation are mechanisms which can be modelled conceptually and mathematically, but are unrelated to human psychology or ethics. SCHUBRING (1935/2000: 323) commented: "it appears that here the Jains have cultivated psychology without soul."

Jaina Mathematics and Karman Theory

Professor Laxmi Chandra JAIN's pioneering work on the mathematical content of classical Jaina karman theoretical texts deals exclusively with the mathematically refined forms of what he calls the 'karma system theoretical approach' or the biocybernetic system functionalism' of the mathematical passages in the Digambara commentaries on the Ṣaṭkhaṇḍāgama and the Kasāyapāhuḍa. What a unit of *karman pudgala* actually represents, how karmic matter (a uniquely Jaina conception) is formed, and how Karman Theory B relates to Karman Theory A does not concern these texts. Hence, the term karman is used in a special sense in the present volume, which applies the language of modern biocybernetic system theory to the karman theory of Nemicandra:

' "Karma" has been translated as "functional" and it has a mathematical significance of two meanings: as a transformation and as an operator with lapse over time' (L.C. JAIN, infra, p. 16/26).[28]

The author has created a whole range of further new translations to account for the specific technical mathematical use of vocabulary that seems familiar from Jaina philosophical contexts. The author's system theoretical interpretation of the guṇasthāna scheme informs the translations of *guṇasthāna* as 'control station', of *mārgaṇāsthāna* as 'way-ward-station', of the *āsrava, saṃvara, nirjarā* as 'cause-effect' or 'input-output relations' of the karman system. Jīva is translated as 'bios' and *dravya* as 'fluent' (elsewhere also: 'organism'). *Kartā* becomes 'functor', *kartṛtva* 'function', and *niṣeka* 'nisus'. Even a trained Jainologist who is unfamiliar with this terminology, which needs to be learned first, will find it difficult to follow both the original texts and their translation through strings of English neologisms. The advantage of this creative exercise of defamiliarisation is that the conceptual differences between instrumental and functional Jaina karma theories become apparent.

Professor L.C. JAIN began his research on the terminology of the mathematical passages in the Digambara scriptures more than fifty years ago. His inquiries commenced in 1955 in form of discussions with Digambara luminaries such as Kṣullaka Manohara Lāla Varṇī 'Sahajānanda', Ratan Chand Mukhtar and Dr Hiralal Jain, which benefited his first major publication entitled *Tiloyapaṇṇattī kā Gaṇita* (1957), comparing the mathematical karman theory in the *Tiloyapaṇṇattī* with modern system theory and the cybernetics of N. WIENER. This approach informed a lifetime of research in the history of Indian mathematics. The south Indian Digambara Jaina School of Mathematics developed a distinctive mathematical symbolism (*saṃdṛṣṭi*) for theorising the classical mathematical Digambara Jaina 'system theory of karman', or *karma praṇālī siddhānta*, an approach which seems to be missing in the Śvetāmbara Karmagranthas. Between 1984-1995 L.C. JAIN worked on three Indian National Science Academy (INSA) funded projects on mathematical passages in Digambara Jain texts. The first project, under Dr A. K. BAG, focussed on the decipherment of the mathematical symbolism in the Labdhisāra

27 GLASENAPP 1942: 3.

28. L.C JAIN 1992, Appendices: 10f. translates karma as 'action' and kriyā as 'activity', cāritra as 'disposition'...

(1984-87). This was followed by two projects on the *Prastāra Ratnāvalī* (1989-91), and Mathematical Contents of the Digambara Jaina Texts of the Karaṇānuyoga Group (1992-95). At this time a long-standing collaboration with the Sanskritist Brahmacāriṇī Dr Prabha JAIN was initiated which informed the seminal work of the author, The Tao of Jaina Sciences (1992), which contains his principal analytical ideas, and the publication of the first volume on the Labdhisāra, containing a glossary of technical terms (L.C. JAIN 1994: 17-66) and summary tables of the proposed decoding of the 'Symbolism and List of Working Symbols', especially the geometric symbolism, or *ākāra saṃdṛṣṭi* (ib., pp. 67-98). Between 2003-2005 four volumes were published in the series Exact Sciences in the Karma Antiquity on the Tiloyapaṇṇatī, Trilokasāra, Lokavibhāga, Jambūdīva Paṇṇatti Saṃgaho and the Karaṇānuyoga texts. The explanation of the symbolism of the Labdhisāra is given in the present first volume[29] of the planned Labdhisāra study, to be published as part of a five volume series entitled *Mathematical Sciences in the Karma Antiquity* comprising the outcomes of the first INSA project on Nemicandra's work, with a focus on the mathematical content of the Labdhisāra and its application to theory of karma. It is based on the original text edited by Gajādhar Lāla JAIN and Śrī Lāla JAIN in 1919, and the Sanskrit and Hindi paraphrases of the original Prakrit by M. SHASTRI (Bombay 1916) and the Hindi commentary by Pt. R.C. MUKHTAR (Mahavirji 1982).

The symbolism employed in the mathematical passages of the Labdhisāra cannot be understood without a prior study of the Trilokasāra and the Gommaṭasāra, and the Kṣapaṇāsāra. Nemicandra understood these four works as 'summary' explanations of the entire Digambara Siddhānta. That is, the Ṣaṭkhaṇḍāgama of Puṣpadanta and Bhūtabali, and the Kasāyapāhuḍa of Guṇadharācārya, and their commentaries. He conceived the Gommaṭasāra as a synopsis of the Ṣaṭkhaṇḍāgama, and the Labdhisāra and Kṣapaṇāsāra as summaries of Guṇadharācārya's Kasāyapāhuḍa, while the Trilokasāra summarises the Tiloyapaṇṇattī (Trilokaprajñapti) of Yativṛṣabhācārya (5th -6th C.). The present first volume, focussing on the Gommaṭasāra Jīvakāṇḍa, and the second volume on the Gommaṭasāra Karmakāṇḍa are conceived as introductions to the study of the mathematical content of Nemicandra's (late 10th - early 11th century) Labdhisāra, Essence of Attainment. This text represents the culmination of the work of Nemicandra, who was given the honorific title Siddhānta Cakravartin, Conqueror of all Scripture, which apparently the Digambara community conveyed only to one who mastered both the Ṣaṭkhaṇḍāgama and the Kasāyapāhuḍa (Kaṣāyaprābhṛta), the two main texts of the so-called Digambara Siddhānta. Because both text collections were, however, hardly accessible, both physically and intellectually,[30] for many centuries, Nemicandra's Gommaṭasāra, Essence of Excellence, was regarded as the most sacred scripture of the Digambara tradition: until the re-discovery and publication of the only surviving manuscripts of the Ṣaṭkhaṇḍāgama and the Kasāyapāhuḍa in the 20th century.[31]

Both the Ṣaṭkhaṇḍāgama and the Kaṣāyapāhuḍa claim to be based on the lost Pūrvas of the 'original' Jaina canon. Generally, the Kasāyapāhuḍa is considered to be a later text than the 2nd century Ṣaṭkhaṇḍāgama. But L.C. JAIN considers it to be an earlier composition of the first century C.E.

The present text is a collection of diverse materials for the study of the Labdhisāra. It is divided into three parts, the first two of which are introductory:

(I) An 'Introduction' of seventy one pages on the mathematical content of the Gommaṭasāra and the Labdhisāra texts, based on the commentaries of ..., comprising five sections, an introduction and concluding remarks (see infra), establishes the necessary link between the Gommaṭasāra and the Labdhisāra.

(II) A Reprint of the original text and the 1927 English translation of the Gommaṭasāra Jīvakāṇḍa by Barrister Jugmandar Lal Jaini and Brahmacāri Śītal Prasād Jain, published in 1927, minus the English commentary, but with Hindi translation.

(III) An English rendition of the *Artha Saṃdṛṣṭi*. Gauge (Measure) Symbolism, a chapter in Paṇḍita Ṭoḍaramala's

29. *The Labdhisāra of Nemicandra Siddhānta Cakravartī*. By Laxmi Chandra JAIN. Jabalpur: Shri Brahmi Sundari Prasthashram.

30. In the early twentieth century the texts were only "preserved in one single Ms. Copy which nobody had been allowed to read for centuries" (ALSDORF 1973: 252f.).

31. JAINI 1979: 51, n. 15.

18th century Samyag-Jñāna Candrikā. This two hundred and one page long English text, presented under the title 'Jīvakāṇḍa' as a 'Prelude' to the symbolism of the Labdhisāra (the proliferation of multiple heading in the books can be disorientating), is the main contribution of the present book. It supplements both the 1927 English translation and the Hindi commentary to the latest Gommaṭasāra edition published by Bhāratīya Jñānapīṭha in 1978-1981, which offer no explanation of the symbolism and meaning of the mathematical verses in Nemicandra's work.

The 'Introduction' comprises seven sections of diverse nature, summarising much needed background information.

(1) 'Introduction'

(2) About the Labdhisāra, its author and date

(3) Summaries of selected verses of the Trilokasāra divergent from the Tiloyapaṇṇatī on the basis of the Sanskrit commentary of Mādhava Candra Traividya (the source for Pt. Ṭoḍaramala's commentary) and the Hindi commentary of Āryikā Viśuddhimati.

(4) Analytical summaries of selected verses from the Gommaṭasāra Jīvakāṇḍa, on the basis of the 11th century auto-commentary Jīva Tattva Pradīpikā of Nemicandra (Karṇāṭaka Vṛtti and Sanskrit Ṭīkā), and the 18th century commentary Samyag-jñāna-candrikā written in ḍhūṇḍhārī by Pt. Ṭoḍaramala (c. 1720-1767).

(5) The 'Exposition (Vṛtti) and Commentary of the Labdhisāra and their Authors' discusses the problem of the authorship of the only Sanskrit commentary of the Labdhisāra, the incomplete anonymous Vṛtti, which is here attributed to the 16th century author Nemicandra [II], though the 14th century Kannarese author Keśavavarṇī is mentioned as another likely source. The only full commentary on the Labdhisāra is contained in Ṭoḍaramala's Samyag-jñāna-candrikā, which has a separate chapter on the mathematical verses of the Labdhisāra and the Kṣapaṇāsāra, entitled Artha Saṃdṛṣṭi Adhikāra, , whose section on the Kṣapaṇāsāra relies on the Kṣapaṇāsāra commentary by Mādhavacandra Traividya of 1203. This chapter is the focus of the present volume.

(6) The section entitled 'Scientific Thought Evident in the Labdhisāra' is based on an article already published by L.C. JAIN (2005b). It comprises the following sub-sections: A. Sets (rāśis), B. Structure (yantra), C. Systems Concepts, D. Symmetry Concepts, E. Sign and Symbol (Saṃdṛṣṭii), F. Cybernetic Contents: (a) Algorithm, (b) Self-Regulation and Self-Reproduction, (c) Linguistics, (d) Calculation Mathematics.
(7) 'Concluding Remarks'.

It is difficult to comment on the mathematical or indeed philosophical content of the selected Artha Saṃdṛṣṭi passages. The work shows that the classical Digambara doctrines of karman theorised changes and transformations of karman in terms of 'sequences and series, progressions and regressions' of 'successive instants (samaya)', of 'instant sets' (p. 42). For the history of science, the value of decoding their mathematical, scientific and philosophical content is immense. Sensibly, the author of *Mathematical Sciences in the Karma Antiquity* refrains from premature conclusions, and presents the reader with the material without adding his own comments. The stated aims of the text are to furnish 'the basis for a chapter on Indian mathematical systems theory in the larger history of ancient mathematical science' (xiv): Its 'ancient form was called the "Karma Theory" or "Action Theory" or "Functional Theory"' (ib.). It is the invaluable great contribution of the author to have explicated the symbolism and the system theoretical implications of the mathematical passages of Nemicandra's work together with his assistant Brahmacāriṇī Doctor Prabha JAIN. The works of Professor L.C. JAIN confine themselves to the Digambara Jaina school of mathematics. It is unlikely that work of a similar magnitude and depth will be conducted in the near future on the mathematical contents of the Śvetāmbara Karma granthas which also point to the lost Dṛṣṭivāda as their source.

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