

INFORMATION PROCESSING IN JAIN COGNITIVE SCIENCE

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Cognition includes three basic processes: action, perception, attention, emotion, learning and language. It also includes the higher level processes: We describe cognitive processes at different level of analysis. Each kind of description is called a theory. A descriptive theory describes phenomenological experience and observable behavior. Many descriptive theories are quantitative models. A computational theory provides an explanation of the behavior described by descriptive theory. A neurological theory describes how brain's behavior produces computations. Jain theory of knowledge is rather an integrated theory of all the above theories. It is descriptive theory as it describes phenomenological experience and observable behavior. The classification of information processing in the forms of intelligence are fundamentally based on phenomenological experience and observable behavior, it is also computational theory as it provides an explanation of the behavior described by descriptive theory. As neurological theory describes how brain's behavior produces changes Jain theory of knowledge is based on karma which can be regarded as the basis of neuroscience too.

Knowledge is the inherent nature of the soul. Each kind of knowledge has its own importance; it is manifested in different degrees depending on subsidence and destruction of karmic veils. When these veils are totally removed infinite knowledge of soul manifests itself in the form of pure and perfect knowledge i.e. all the imperfectness, incompleteness of knowledge dissolves with the rise of omniscience.

There are mainly five types of knowledge and these five types of knowledge have further sub-divisions. The process of knowing the things is also considered as the part of the knowledge. The five basic division of the knowledge are as follows :

1. **Perceptual knowledge** - knowledge that is gained through senses and mind.
2. **Verbal knowledge** - knowledge that is gained through sound, hints, symbols and scriptures etc.
3. **Clairvoyance** - Knowledge of material objects that is gained directly through soul. In humans clairvoyance is acquired through spiritual discipline, where as for the inhabitants of heaven and hell, it is inborn.
4. **Mind reading** - it is an act of seeing the objects of other's mind. This knowledge is acquired by ascetics at a high level of spirituality.
5. **Omniscience** - knowledge of all the substances in all their modes of past, present and future is *kevalajnāna*.¹

The five varieties of knowledge divide into the two classes of approved means of knowledge, the mediate and immediate. The division of knowledge into two classes is an innovation of Jain philosophers. In the established Indian tradition, the approved means of knowledge were most often divided into four classes: perception, inference, analogy and articulation/scripture. Umāsvāti follows the ancient Jain tradition of the five varieties of knowledge and the innovative allocation of these as mediate or immediate knowledge.

Information Processing approach on the other hand views the mind a complex, symbol manipulating system that operates like a computer. The human mind works just like a computer.² It takes information, organizes it, stores it for later use and then retrieves it when necessary. In a computer, information (data) is entered into the computer through a keyboard or scanner or another input device. The human corollary for this would be

¹ Nandī, ed. Acharya Mahapragya, p.37.

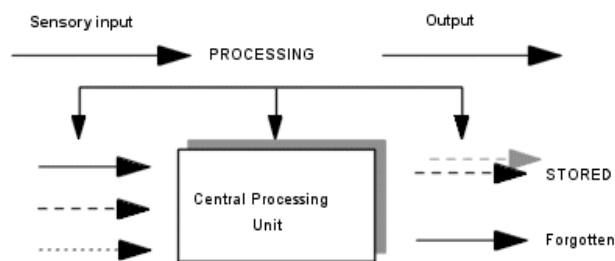
nāṇam pancaviham paṇṇattam, taṁ jahā-

ābhinihoḥiṇā nā nam, suyaṇāṇam, ohiṇā naṁ, maṇapajjavaṇānaṁ, kevalaṇāṇam

² Antony J. Stanford, *Cognition and Cognitive Psychology*, p.6.

the ears, the eyes or other sense organs. The data needs to be processed, i.e. comparisons and logical decisions must be made. The 'brains' of the computer is the Central Processing Unit (CPU) where the data is processed. The human match for this task is called Working Memory where we think about and process the entered data. To store its information the computer uses hard disks, floppy disks and tapes. Humans store information in Long Term Memory. Having processed the information, computers need to display information as an out-put. This may be visual display on the screen or hardcopy paper output. The human equivalent is talking, walking, smiling, shaking hands and such other action.

Fig. No. 1.1 Information Processing in Computer

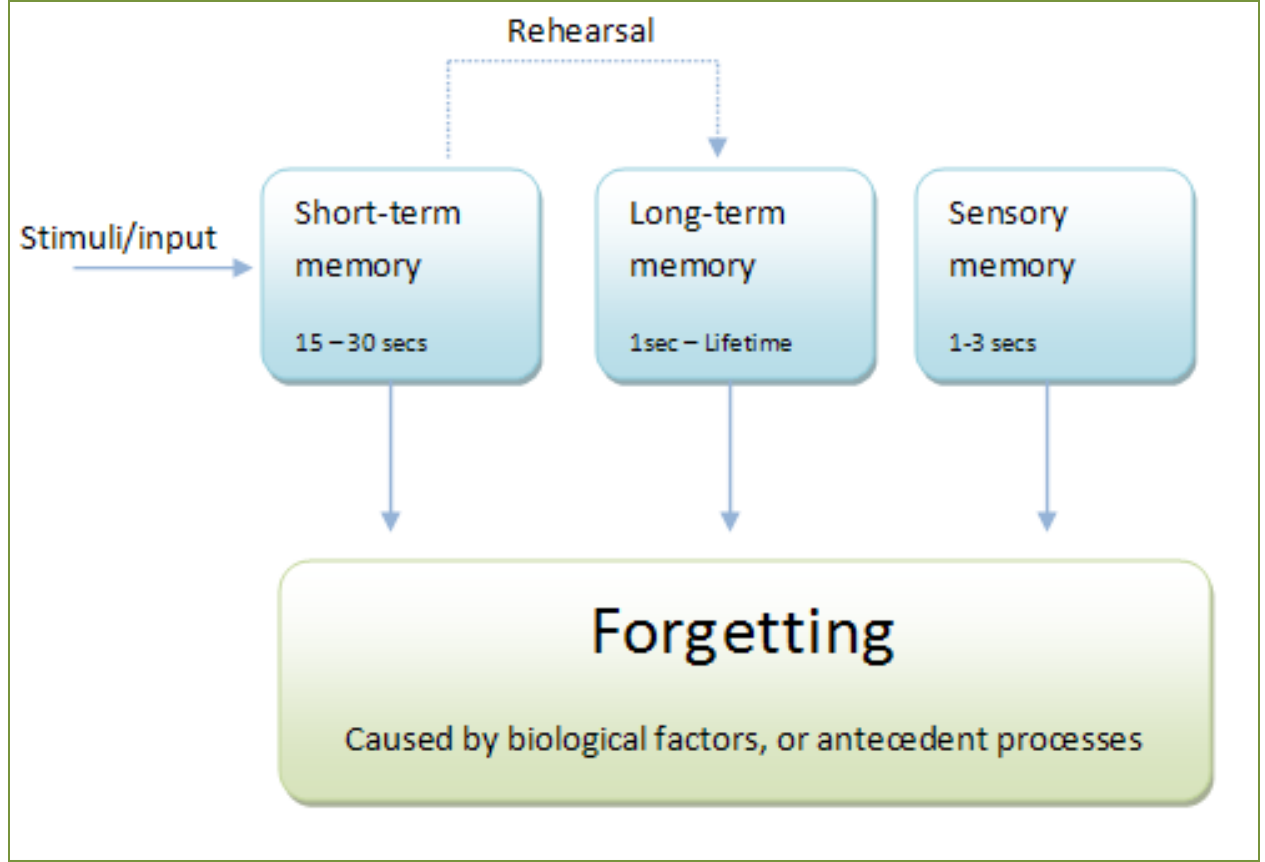


According to this view there are three

kinds of memory:

Sensory registers. The part of the memory that receives all the information a person senses.

Short-term memory (STM). Also known as working memory, the part of memory where new information is held temporarily until it is either lost or placed into long-term memory.



Long-term memory (LTM). The part of memory which has an unlimited capacity and can hold information indefinitely as described by Atkinson and Edwards.³ This is very true from the Jain point of view as the scriptures such as *Ācārāṅga*⁴ and *Āvaśyaka Cūrṇī*, they recommend the possibility of recollection of infinite period that an organism has undergone. This kind of knowledge is a part of perceptual knowledge called *Jātismṛti jñāna*. In fact the whole process of information Processing in Jainism is included in the first among the five types of knowledge known as matijñāna or perceptual knowledge. It has been defined in '*Jain SiddhāntaDīpikā*'⁵ as -

³ Earnest R. Hillgard, Richard C. Atkinson, Rita L. Atkinson. *Introduction to Psychology*, New Delhi, 1979. p. 237

Cf. Edwards W. *Conversation In Human Information Processing*, p.55.

⁴ *Ācārāṅga Bhāṣyaṃ*, 1.1-4.

⁵ *Jain Siddhānta Dīpikā* of Acharya Tulasi, p. 28.

'Indriyamanonibandhanam matih'

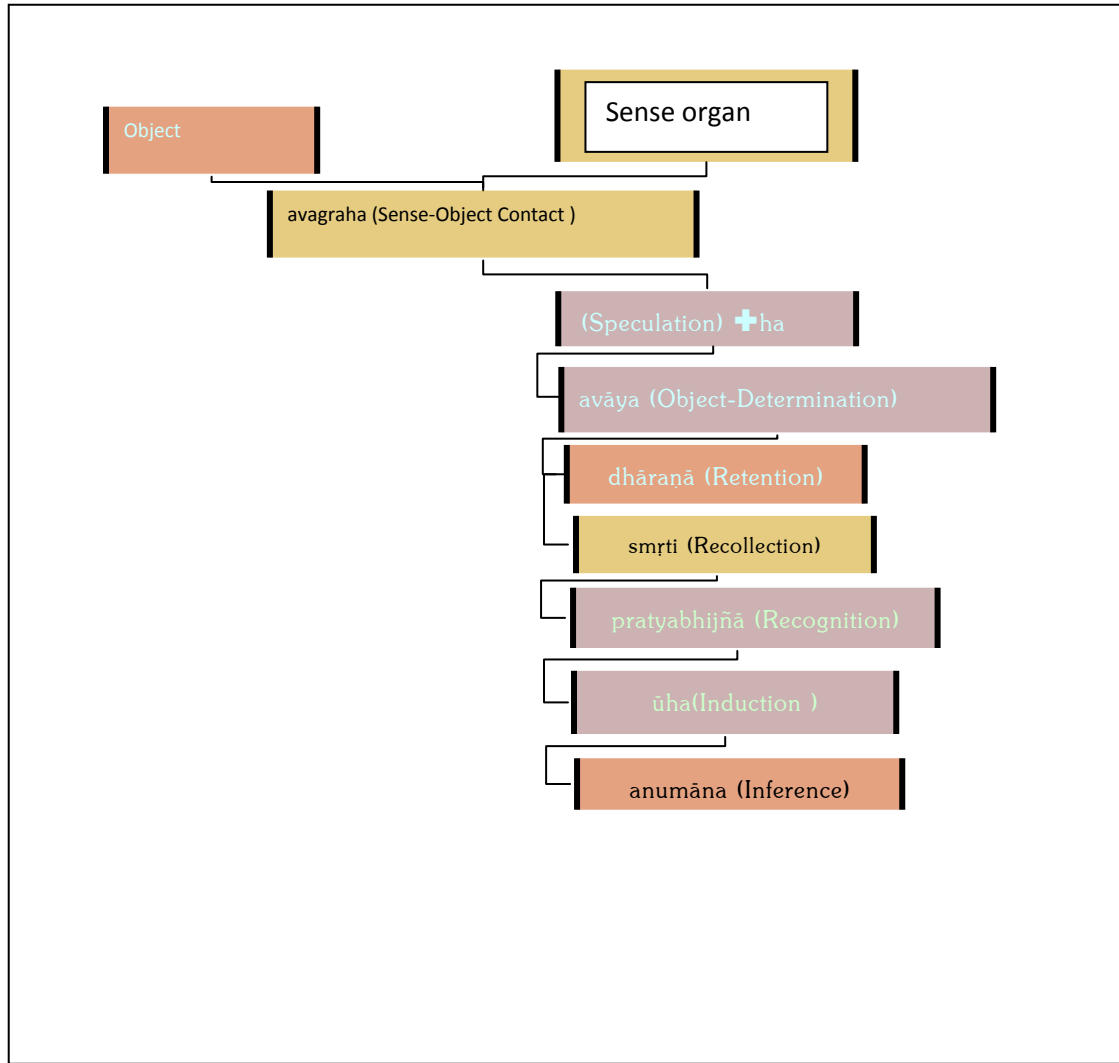
The knowledge gained through senses and mind is perceptual knowledge. The word '*ābhinibodhika*' also has been used for perceptual knowledge in Jain scriptures.

Perceptual knowledge arises from the senses alone, the mind alone or from two acting together. There are beings without a mind such as plants, trees and some lower animals whose knowledge is necessarily through their sense alone. Plants and trees have only one sense, the tactile sense. Therefore their perception is produced by touch alone.

In human beings, however, perceptual knowledge is sometimes produced by the joint activity of the senses and the mind and at other times by the activity of the mind alone. For instance, the perceptual knowledge that 'this is a table' is produced by the collaboration of the sense of sight and the mind whereas remembering what the table looks like requires only the mind to act. There is also a variety of perceptual knowledge that is instinctive, such as the ability of a plant to grow towards the light or of a creeper towards a support⁶

Jain epistemology has a wide literature on cognition, especially the perceptual cognition where the exact process of information processing is divided into multi steps, which is one of the most unique contributions of Jain view of cognition. The process start with sense object contact as a sensory input similar to that of sensory registration in neuro-biology. *indriya sannikaṣa* in other Indian philosophy and passes through various stages such as *avagraha* (sensation), *īhā* (speculation), *avāya* (perceptual Judgement), *dhāraṇā* (retention), *smṛti* (memory), *pratyabhijñā* (recognition), *tarka* (inductive reasoning) and *anumāna* (inference). And the out put is in the form of verbal expression. In fact each antecedent acts as the input for the consequent stages which is the output of the antecedent as shown in the fig. No.1

⁶ *Nandī*, 3.39.



Out of these steps the first step *avagraha* in the process acts as an input of sensory data. Sensory input is attained only when there is a contact between the object and senses. But prior to this sense-organ-appropriation stage discusses in detail each of five senses, their shapes- external and internal structure and their functions has been explained elaborately in Jain canons such as *Nandī* and *Viśeshāvaśyaka bhāṣya*. The number of the senses remains the same in both scientific and Jain tradition. The classifications of sense organs is physical and psychical is exclusively unique and scientific. However the contactability is common in both the traditions. After the stage of sensation real processing starts which

ends at retention which stores the data. All the steps after retention are different forms of output. The major and necessary part of information processing are as follows

1. *avagraha* (Sensation)
2. *ihā* (Speculation)
3. *avāya* (Perceptual judgment)
4. *dhāraṇa* (Retention)⁷

1. Sensation

Sensation means cognition of a generic character of the object as a result of the contact between the sense and the object. There occurs sensation, that is, cognition of the pure general character without the manifestation of any particular characteristic on the contact due to situation of the sense-organ and the object at a proper conditions as place and other criterias like light, etc being filled. In the wake of this there occurs the indeterminate cognition of the general character (of the) object. This is called '*avagraha*' or sensation.⁸

2. Speculation

Further analysis of the sensory data after sensation is known as *ihā or speculation*.⁹

Speculation consists in the experience 'This must be that.' Speculation is an experience which brings up the rear of doubt 'this is that or anything else', through agreement and difference in respect of a characteristic feature, for example, 'it must be a sound'.¹⁰

⁷ Ibid, 3.40.

⁸ *Uggaha ihāvāyadhāraṇā eva hunti cattāri ābhiñbohiya nāṇassa, bheyavattū samāseṇaṃ*

⁸ *Jaina SiddhāntaDīpikā* of AcharyaTulsi, p. 28.

⁹ *Pramāṇa Mīmāṃsā* of Hemacandra, A. 27.

avagrahītvishēṣākāṅkṣaṇaṃ ihā/

Speculation is an attitude of the mind which leads to the determination of the specific character of the object by laying emphasis upon the real characteristics that are perceived and the elimination of the unreal attributes that are not cognized.

3. Perceptual Judgment

Perceptual judgment is the specific determination (of the object), viz. 'this is that.'¹¹ For instance, 'it is a sound indeed'.

4. Retention

Retention is the imprint of the identification of the object, creating an impression in the mind, which is experienced as memory. The commentary of *Tattvārtha Sūtra* explains imprint with synonyms such as continued cognition, memory, retention and determination.¹² Thus the four stages constitute the formula for complete mental activity during the process of perception.

Once senses are equipped to cognize the object there occurs the first stage called *avagraha*

similar to that sensory registration stage of cognitive psychology, where there occurs a real contact between the object and sense. This leads to input of the sensory data.

¹⁰ *Nandī*, 3.54.

¹¹ *Jain Siddhānta Dipikā* of AcharyaTulsi, 1998, A. 2.14.

¹² *That Which Is*, p.16.

The next stage to the sensory registration is feature analysis stage. This stage in Jainism is known as *īha* (speculation) where the mind processes the data acquired as $p \vee q, \neg p \cdot \neg q$. According to which any decision that takes place in this process logically called as *Modus Tollens*. Mind speculates over what is resisters through sense and eliminates the inappropriate information this stage is explained cognitive biology as feature analysis stage.

In the third stage the object is the mind hold perceptual judgment which according to Arnold is the stage of decision this stage has two classes of judgment as has been described earlier they are categorization judgment and contextual judgment . After judgments of the brain retains the object in Memory. This stage is called as *dhāraṇā*. *Recollection* and recognition dealt in detail cognitive biology which includes precise centre of brain which lack in Jainism. Of course this can be said that in these canonical texts, there exists crudest form of neuro-biology having more intensity. Logic in cognitive science and logic and *anumāna* explained scriptures such as *Pramāṇa Mīmāṃsa* and *Bhikṣu Nyāyakaṇṭhika* is a vast subject. However indications of two of the similarities between the concept of *tarka* in Jainism is in accordance with the rules of formal logic as there exists no difference between *anvaya* and M.P, and *vyatireka* and M.T. Moreover they must also be studied from biological point of view as too. The exact process of with their corresponding brain areas of information processing can be studied further.

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