a report on

International Seminar on Science & Technology in Ancient Indian Texts (SATAIT)

Jointly organized by

Center for Indic Studies, University of Massachusetts (Dartmouth), USA & Special Center for Sanskrit Studies, Jawaharlal Nehru University, New Delhi

during

9-10th January, 2010

at

Special Center for Sanskrit Studies

Jawaharlal Nehru University, New Delhi

http://sanskrit.jnu.ac.in/conf/stait/index.html

The international seminar on Science And Technology in Ancient Indian Texts (SATAIT) was a joint seminar organized by Special Center for Sanskrit Studies, Jawaharlal Nehru University, Delhi, India and Center for Indic Studies, University of Massachusetts, Dartmouth, USA. The papers were invited in the following areas:

- 1. Biological & Environmental Sciences
- 2. Chemical Sciences & Metallurgy
- 3. Physical Sciences & Astronomy
- 4. Medical Sciences, Ayurveda, Yoga for healing
- 5. Mathematical and linguistic Sciences
- 6. Engineering including vāstu, vimāna shāstra, ship building, war, armament
- 7. Agricultural sciences & animal husbandry
- 8. Other novel sciences (not covered under 1-7)

An advisory committee of eminent scholars was constituted to guide us in the organization of this seminar and plan collaborative initiatives after the seminar. The following scholars kindly accepted to on our advisory committee

- Mrs. Swarnlata, HoD, Technology Development for Indian Languages (TDIL), Ministry of Communications & Information Technology (MCIT)
- **Radhavallabh Tripathi**, Professor & Vice Chancellor, Rashtriya Sanskrit Sansthan, New Delhi
- K. Ramakrishna Rao, Professor & Chairman, Indian Council of Philosophical Research (ICPR), 36 Tughlakabad Institutional Area, New Delhi – 110 062
- **Rajendra Prasad**, Rector, J.N.U. & Professor, School of Life Sciences, J.N.U.
- V.K Jain, Registrar, J.N.U. & Professor School of Environmental Sciences, J.N.U.
- Vacaspati Upadhyay, Professor & Vice Chancellor, Sri Lal Bahadur Shastri Rashtriya Sanskrit Vidyapeeth, New Delhi
- M. M. Agrawal, Professor & Head, Dept of Sanskrit, Dean, Faculty of Arts, University of Delhi
- **Balram Singh**, Director, Center for Indic Studies & Botulinum Research Center, University of Massachusetts Dartmouth, USA
- Michel Danino, Swarnambika Layout, Ramnagar, Coimbatore, TN
- Shukla Mukherjee, Associate Professor & Project Officer, Rashtriya Sanskrit Sansthan, New Delhi
- Kapil Kapoor, Professor & ex-Rector, J.N.U.
- Sankar Basu, Professor & Dean, School of Languages Literature & Culture Studies, J.N.U., Chairperson, Special Center for Sanskrit Studies, J.N.U.
- Shashiprabha Kumar, Professor, Special Center for Sanskrit Studies, J.N.U.
- Girish Nath Jha, Associate Professor, Special Center for Sanskrit Studies, J.N.U., (Hon. Professor, Center for Indic Studies, University of Massachusetts, Dartmouth for SATIAT)

A meeting of the advisory committee was held on 30/12/2009 in the committee room (ground floor) of the Special Center for Sanskrit Studies, J.N.U. The meeting was attended by 6 members. Umesh Kumar Singh who is now the Research Associate for SATIAT also attended the meeting. Prof Bal Ram Singh participated from University of Massachusetts-Dartmouth through videoconferencing on Skype. The details of the report can be obtained <u>here</u>

Report of the SATIAT seminar

There were a total of 11 sessions, 29 invited speakers, 06 inaugural session speakers, 04 plenary session speakers, 08 session-chairs, 11 coordinators and 04 panelists. 08 speakers/participants could not reach due to last minute logistical problems.

The papers were presented in following areas:

- 1. Chemical sciences, metallurgy($vim\bar{a}nas\bar{a}stra$) =2
- 2. History/philosophy of science/conceptual = 9
- 3. Language Technology/formal treatment of language = 1
- 4. Language (Phonetics/acoustics)=1
- 5. Maths = 5
- 6. Mech. Eng. = 1
- 7. Physics = 2
- 8. Astronomy = 1
- 9. Ayurveda = 2
- 10. Yoga & cognitive sciences = 2
- 11. Law = 1
- 12. Knowledge management (by the panelists) =3

Papers in the following areas were missing

- 1. Vāstu,
- 2. Ship building, war, armament, surgery,
- 3. Formal linguistics
- 4. Agriculture

Day 1: Saturday, January 9, 2010

session1: Auditorium of Arts & Aesthetics 09:00 to 11:00: Inaugural session

The session had the following structure -

- Prof Rajendra Prasad, Rector, J.N.U. Welcome address, Introduction to JNU
- Prof Bal Ram Singh, University of Massachusetts, Dartmouth, USA *Introduction to the theme of seminar*
- Mrs. Swarnlata, Head, TDIL program, Dept of IT, Govt of India Inaugural Speech-I
- Prof. P. N. Srivastava, former V.C. & Professor Emeritus, JNU Inaugural Speech-II
- Rajiv Malhotra, President, Infinity Foundation, Princeton, New Jersey, USA Keynote Speech
- Prof. Sankar Basu, Chairperson, Special Center for Sanskrit Studies, JNU Vote of thanks

Coordinator: Dr. Girish Nath Jha, J.N.U. Rapporteur: R. Chandrashekar, J.N.U.

Dr Girish Nath Jha, Associate Professor, Special Center for Sanskrit Studies, JNU invited the guests to the stage, and to light the lamp with chanting of Vedic mantras by students. Dr Jha introduced each speaker and asked them to present their address.

Prof Rajendra Prasad, Rector, JNU, welcomed this initiative by the two participating institutes and congratulated Prof Bal Ram Singh for starting this project. He promised every support to this. Later he gave a very lively presentation of JNU in terms of faculty, student, interdisciplinary strength, culture etc.

Prof Bal Ram Singh, director Center for Indic Studies, U.Massachusetts Dartmouth, introduced the theme of the seminar and also gave a brief snapshot of his Center of Indic Studies. He also outlined the project and appointing Dr Girish Nath Jha as the first Mukesh & Priti Chatter Professor at CIS, UMass-D.

Mrs Swarnlata, Head TDIL program of DIT delivered the first inaugural speech. She highlighted the importance of this work and said that though previous initiatives in this direction have not yielded any substantial results, yet she hoped that the present initiative will move in the right direction. She also briefed about DIT's initiatives to bring Vedic Sanskrit to Unicode.

Prof P. N. Shrivastava, Professor Emeritus and former VC JNU delivered the second inaugural speech. He focused on the so-called dogmas of traditional Indian thinking and overstated claims which according to him did more disservice than service to the tradition. He emphasized the need to involve INSA in this effort and promised to help get INSA involved.

Rajiv Malhotra, President, Infinity Foundation, Princeton New Jersey, USA gave the keynote speech. Rajiv presented a dichotomy of sciences based on a model and sciences without a model, and suggested that oriental sciences belonged to the second. *This classification may be questioned with the argument that there may not have been an explicit theory leading to a model, but an implicit one because the possibility of creating knowledge without sufficient theorizing or struggle with nature is difficult to fathom.*

He said that there were two scenarios - proven scientific (reproducible) practices with desired results but without documentation, and the reverse may also be true. He cautioned against taking extreme positions either on debunking ancient Indian texts as fiction or as pure sciences, and emphasized on the criterion of 'empirical evidence' as necessary to rate something as science.

Prof Sankar Basu, the chairperson of the Special Center of Sanskrit Studies offered the vote of thanks to all the participants in the inaugural session, all the other participants, students and faculty and congratulated Prof Bal Ram Singh and Dr Jha for this innovative initiative.

Session2: Auditorium of Arts & Aesthetics 1130 to 1300 hrs: Plenary Session The session had the following speakers -

- **Bal Ram Singh**, University of Massachusetts, Dartmouth, USA, *Scientifying the science an art of making everything a science*
- Ram Karan Sharma, Delhi, Indian metrics and binary system of notation
- C S R Prabhu, DDG, NIC, Hyderabad, Origin of science & technology
- S C Jha, Chairman, Quippo Infrastructure Equipments Ltd, *Indian agriculture in the context of economic policy*

Session Coordinator: Dr. Girish Nath Jha, J.N.U. Session Rapporteur: Dr. R. Chandrashekar, J.N.U

Prof. Bal Ram Singh, University of Massachusetts, Dartmouth, USA gave his thought provoking speech on the topic "*Scientifying the science - an art of making everything a science*." He pointed about the dogmas in science itself. He said that the theories in science have been unquestionably accepted or we do not have answers, like in the evolution of man, theory says mutations occurred, but there is no answer why it occurred, but the theory is accepted. Giving some examples he said that while humans have only 30,000 genes, mice have 50,000 genes and plants have approximately 850,000 genes. The reason behind these facts has not been explained so far. According to the scientific criteria, humans are the least evolved creatures. According to him, this acknowledgement should bring humility in humans. He discussed modern thermo-dynamics and the theory of ideal gases and said that there was no ideal gas as such, but still it was assumed for the purpose of theory. Every theory is based on some philosophy and Indian culture is very rich in its philosophy. He gave the example of watermelon changing color in the presence of other watermelons (a well known saying in India) and presented a similar experiment on chillies changing color in presence of other chillies. Thus according to Prof Singh, culture and philosophy are also the foundations of sciences. However, they needed to be scientified.

Second speaker of this session was **Prof. Ram Karan Sharma**, well-known scholar of Sanskrit and former Vice-Chancellor of various Sanskrit universities. He delivered his talk on "*Indian metrics and binary system of notation*". First of all, he supported the view of previous speaker that in the commentary of yogasutra, Vacaspati Mishra has said that in the presence of a Yogi, minds of even the fierce animals transform like that of the yogi's mind. The same is said in the chapter1 of *Manusmriti*. According to him, śāstras describe moon as being constituted of water which can be correlated with the recent discovery of water on moon. According to him, the 1986 American Oriental Society (AOS) meeting had a scholar claiming that Pingala, the author of *chandaśāstra* as the originator of binary numerals. He explained the similarity that existed between Indian metrics and the binary system.

Dr. C.S.R. Prabhu was the third speaker of this session. According to him, we live in three worlds - world of science, world of philosophy and world of religion. In India, the religion is mixed with science. For example Vedas are the source of Indian religion and for every vedic mantra there is a rśi, devatā and chandas. The devatā according to him, means subject eg: *priśniparņi devatā (priśniparņi* is a plant). Thus botany is mixed with Indian religious practices. As per him, the history of science is all western and not Indian. But in India we see amazing creations by our ancient people – rock-cut Ellora temples, ś*ravaņabelagola gomatateśvara* statue, iron pillar, the Taj Mahal which are very hard to rebuild in present times. This means we had very powerful science and technology.

At the end of his talk he presented a demo of some products developed on the basis of ancient Indian scientific texts - *tamogarbha loha* was one of them which absorbs 78% of radar waves.

Fourth and last speaker of the session was Dr. S.C. Jha, Chairman, Quippo Infrastructure Equipments Ltd. His topic was Indian agriculture in the context of economic policy and he presented the current status of Indian agricultural and economy and ways to improve it.

After lunch the venue shifted to the Special Center of Sanskrit Studies

Session3 (parallel): Committee room

1400-1630 hrs: Chemical, Biological & Environmental Sciences Chair: Prof. S.C. Goswami, Delhi University

Speakers

- Shashi Tiwari, Delhi University, Origin of environmental science from vedas
- Madhu Khanna, Jamia Millia Islamia, Delhi, Ganga avatarana: a myth or an environmental science
- C S R Prabhu, NIC, Hyderabad, high technology in ancient Sanskrit manuscripts

Session Coordinator: Dr Santosh Shukla, J.N.U. Session Rapporteur: Dr. R. Chandrashekar, J.N.U.

In this session first presentation was made by Prof. Shashi Tiwari, Delhi University. Her topic was "Origin of Environmental Sciences from the Vedas." According to her Vedic vision on environment was well-defined in one verse of the Atharvaveda where three coverings of our surroundings are referred as chandansi (AV 18.1.17). Natural aspects or energies are glorified by the Vedic seers as deities. Yāska has classified these Gods among three groups i.e. upper, middle and lower according to the division of the universe. *rta* is the name given to cosmic law which governs everything in the universe. Varuņa is depicted as the lord of this universal order. The bhūmisūkta of Atharvaveda (12.1) denotes environmental consciousness of Vedic people especially in reference to earth. The hymn talks about the different energies which are generated from the body of the earth. According to *rgveda* (7.49.2) water as a part of human environment occurs in five forms -divyah, sravanti, khanitrimah, svayanjah, samudrarthah. Concluding her talk, she said that the awareness of Vedic seers about the environment, and its constituents is very comprehensive. They desired to live a life of hundred years, planned unpolluted, clean surroundings and prayed for peaceful environment.

The second talk was by Prof. Madhu Khanna, Jamia Millia Islamia, Delhi. Her topic was " gangāvataraņa: a myth or an environmental science." In this talk, she did the ecological interpretation of Gangā's descent. She said that there are many versions of Ganga's descent in Rāmāyaṇa, Mahābhārata, Bhāgavata etc. Again Gangā is called Viṣṇupadī in Purāṇas and Viṣṇu is generally interpreted as Sun in the Vedas. It means that Gangā's descent is the water cycle because water evaporates and goes up to the sky (viṣṇupada) and from sky (viṣṇupada) it descends to the ground (bhūmi) as rain in the form of water and then to the netherworld (pātāla). Viṣṇu is sun/solar energy which melts the snow thus becomes the origin of Gangā. śiva is nothing but forests because siva protected earth from the torrents of Gangā (when she descended), by binding her with his matted locks $(ja!a;\bar{a})$. In the nature, we see that it is the forests and green cover in general that protect us from the hydrological imbalances and disasters.

Third and last talk of this session was delivered by Dr. C.S.R. Prabhu on the topic "*High technology in ancient Sanskrit manuscripts.*" He said that some ancient Indian scientific texts like *brhadvimāna-śāstra* were so advance in descriptions that many have called them a fraud or a bluff and never bothered to investigate deeply. But the text contains detailed technological descriptions of space technology, aeronautics, metallurgy and material science for *vimānas* of various kinds in practical terms. He informed that the laboratory investigations have been performed on the preparation of alloys and other materials suggested in the text at various laboratories in Hyderabad. About 10 new materials have been prepared based on the descriptions and formulations given in the *brhadvimāna-śāstra*. Concluding his talk he said that many of these descriptions are very sophisticated, more advanced than modern counterparts. The materials and alloys produced are found to be unknown to modern technology. This provides an evidence for the veracity of the text, the descriptions can be realized in practice if only careful investigations are performed after correct decipherment of the formulas and formulations. A national level effort is essential to derive, decipher and reproduce advanced materials, methodologies, processes and technologies from *vimāna-śāstra* and other ancient texts.

Session4 (parallel): Classroom #113

1400-1630: Physical Sciences & Astronomy

Chair: Prof. SSN Murthy, School of Physical Sciences, JNU

Speakers

- Soma Basu, Rabindra Bharati University, Kolkata, *Agni in the Rgveda in the light of the physical sciences*
- Vidyarthi Nanduri, Cosmology Vedas Research, Hyderabad, the spirit of scientific research : cosmology vedas -unity in diversity
- Shashiprabha Kumar, SCSS, JNU, Vaiśeşika insights on science
- S. S. N. Murthy, School of Physical Sciences, JNU "Study of the science of vedic religion as depicted in ancient texts: with emphasis on numeral symbolism and cross-cultural (dis)similarities".

Session Coordinator: Dr. Hariram Mishra, SCSS, J.N.U. Session Rapporteur: Diwakar Mishra, SCSS, J.N.U.

Dr. Soma Basu from Rabindra Bharati University, Kolkata, delivered her talk on "Agni in Rgveda in the Light of the Physical Sciences". In her talk, she discussed some theories found in rgveda related to agni, temperature and light. She quoted mantras where properties of agni are found to be the properties of temperature, light and in some cases that of energy as described by modern physics. She has taken mantras from rgveda which can have physiological interpretation of agni as light or temperature, as nothing is without agni or temperature, whether it is positive or negative in numerals, agni (light) is the fastest (tūrnitamah) etc.

The second talk was delivered by Dr. Vidyarthi Nanduri on "*The Spirit of Scientific Research: Cosmology, Vedas – Unity in Diversity*". He gave a very rich presentation of 80 slides on his topic.

He illustrated his presentation with rich graphic and diagrammatic materials. He also presented a hypothesis that basic cosmic element is not the dark matter but eliminating light material. He described various forms of energy with a devotional (*bhakti*) approach, described different energies behind different Vedic and later forms of deities like *mahālakṣmī*, *gaṇeśa*, *viṣṇu*, *nārāyaṇa*, *rāma* etc. He detailed cosmic plasma at many points and also plasma energy model (1991) and its different applications. He also elaborated the energy matter behind different galaxies and *nakṣatras*.

The third talk was delivered by Prof. Dr. Shashiprabha Kumar of the Special Centre for Sanskrit Studies, JNU on "Vaiśeṣika insights on science". She presented the six categories of entity as described in the Vaiśeṣika philosophy, and its model under which all the real entities of the universe can be categorized. She explained how these categories apply on the world categories. She also discussed the model of intellect according to Vaiśeṣika. She mentioned the importance of Vaiśeṣika theories of sound, number and cognition which she had not presented in the paper. She suggested that modern scientists should begin from where Vaiśeṣikas have stopped.

Prof S.S.N. Murthy who was assigned to another session the next day, wished to present in this session, and since there was some time remaining, he was allowed to go ahead.

Prof. S. S. N. Murthy of School of Physical Sciences, JNU on "Study of the science of vedic religion as depicted in ancient texts: with emphasis on numeral symbolism and cross-cultural (dis)similarities". His discussion was primarily focused on the numerals in brāhmaņa texts. The main focus of this presentation was numeral symbolism in Vedic, Harappan and other civilizations. The questions being which number was associated with which deity or concept and which had relatively more significance than others. One important thing he emphasized was the importance of number 11, which is not present in Harappan evidence of number use. He presented this as an important proof for the separation of the Vedic and Harappan civilizations. Following an analytical approach, he presented rich graphic materials from the historical evidences, in which he showed (non-Vedic) deities in Harappan seals.

Day2: Sunday, January 10, 2010

Venue: Special Center for Sanskrit Studies 9:00 to 09:30: Breakfast & Registration

Session 5 (parallel): Committee Room 930 -1100: Medical Sciences, Ayurveda, Yoga - I Chair: K K Mishra, former head, Sanskrit, NCERT

Speakers

- Vaidyaratnam Dr. R. Raghavan, International Foundation for Ayurvedic Research and Training Trust, Kerala, *The applicative wonders of Ayurveda the mother of all healing sciences*
- Yamini Bhusan Tripathi , BHU, Ayurvedic medicines are marketed as food supplement/OTC product in USA: They are safe and effective, if purchased from ethical source

Session Coordinator: Dr. Ramnath Jha, J.N.U. Session Rapporteur: Dr. R. Chandrashekar, J.N.U.

Vaidyaratnam Dr. R. Raghavan from International Foundation for Ayurvedic Research and Training Trust, Kerala delivered the first lecture of the session titled "*The Applicative Wonders of Ayurveda – the Mother of all Healing Sciences*". He made mostly video presentations of the complicated cures he had done. He showed four cases of patients who had lost hope from the other treatments. In one case a newly born child was suggested for euthanasia (mercy killing) which was later cured by Ayurvedic methods and got a normal life. He introduced the *'marma sandvanam'* mentioned in Indian *śāstras* which acts on nerves very fast but it is very different from acupuncture and acupressure. At the end of his presentation, he demonstrated $n\bar{a}d\bar{a}$ examination of the two scholars present. Following the Ayurvedic theory, he does and prefers person oriented (or subjective) treatment and not disease centred like other medicine systems. This is due to difference in nature of individual body.

Second presentation was given by Prof Yamini Bhushan Tripathi from BHU, Varanasi on " $\bar{A}yurvedic$ Medicines are Marketed as Food Supplement/OTC product in USA: they are Safe and Effective, if Purchased from Ethical Source". In his presentation he quoted the basic constituents of body – physical – $v\bar{a}ta$, pitta, kapha and abstract – sattva, rajas, tamas. The advantage of the system is that the medicines are also described in these terms and not in terms of diseases which supports the previously mentioned subjective cure methods. He briefly described the rasāyaṇas. He examined the claims of some medicine manufacturers that their medicines were nano materials. He suggests that antibiotics should be taken for fast actions and that this is not a concept found in Ayurveda. He informed about some Ayurvedic patents taken by BHU. He emphasized on developing a model through which the Ayurvedic cures and medicines can be tested and verified in modern sciences also and taken as patents.

The chair of the session pointed out the significance of both presentations. He pointed that Ayurveda cures the cause and not the symptoms. He also mentioned four categories of conduct to stay fit that is also the part of Ayurveda. He shared his some experiences and suggested some steps to be taken in the field of medicine manufacturing.

Session 6 (parallel): Classroom#113 930 -1100: Mathematical Sciences-I Chair: Prof. Satish Chand Abbi, Prof Emeritus, IIT Delhi

Speakers

- Pradip Kumar Majumdar, Rabindra Bharati University, Kolkata, *Numerals in the Brahmana literature*
- M G Prasad, Stevens Institute of Technology, Hoboken, NJ, USA, *Four-fold description of sound: vedic view*
- Nabanarayan Bandyopadhyay, Rabindra Bharati University, Kolkata, An unpublished commentary of the Kātyāyana śulba-sutra

Session Coordinator: Dr. Rajnish Mishra, SCSS, J.N.U. Session Rapporteur: Diwakar Mishra, SCSS, J.N.U. The first talk was by Prof. Pradeep Kumar Majumdar, Rabindra Bharti University, Kolkata on the topic "*Numerals in Brāhmana literature*". He explained the number system of *brāhmaņas* and clarified that the number of verses in the chapters of *brāhmaņas* also have a meaningful sequence. He gave the example of *Aitareya Brāhmaņa*. He also focused on similarities between both the number systems - Indian and western. He quoted from *chandaśāstra* saying that the mātrās and *varņas* of the *Gāyatrī*, *Usnika*, *Anustup* etc. also have relations.

The second presentation was by Prof M. G. Prasad from the Stevens Institute of Technology, Hoboken, NJ, USA. His topic was "Four-fold description of sound: vedic view". He described the process of generating a sound and said that the vision of *rsis* was a complete phenomena which divided the sound or $n\bar{a}da$ in four types. He said that the oral tradition of Vedas does not mean that there was no writing technique. Expressing anything or any knowledge can not be communicated better than a vocal and physical presence even in the modern age of computers. That is why the vedic rsis emphasized on the vocal tradition of chanting the mantras. Vedas are also called as *sabda* which means sound. This *sabda* is played at mānusī and daivī vīnā. The string of this divine vīnā is spinal cord. He concluded that *nāda-yoga* is union of source – path - receiver, through vibration-sound (spanda-nāda). *sabda (nāda)* is the manifestation of *param bramhan*. It is essential pathway. *nāda* (resulting from the movement and also self existing) is the seed of articulation and the manifestation of various expressions. Supreme being manifests itself through $n\bar{a}ma$ ($n\bar{a}da$), form and spiritual energy in deities ($devat\bar{a}$). Listening with receptive and pure mind (concentration) is essential in spiritual path and development (śruti, śravana, śrotavya). Purity of mind, clarity and precision in phonetics and devotion leads to spiritual experiences through *japa*, *bhajana*, music, mantra, chants, etc. Sound is the most subtle measure (*sabda tanmātrā*). Sound, space are eternally united. Sound and space are both bodies of the Supreme Being. Om is the name and form of the Supreme.

The last talk was by Prof Nabanarayan Bandyopadhyaya, Rabindra Bharti university Kolkata. His topic was "An unpublished commentary of the Kātyāyana-śulbasūtra". He informed about a manuscript of a commentary of this text written by Gagandhara Pathaka (17th century) which has not been mentioned by any editor/translator so far. Gagandhara Pathaka was a son of Ramacandra Pathaka and brother of Yagyika Narayana, follower of Harishankara Dixita (teacher of his father) and ancestor of Devabhadra. In this commentary, many charts, diagrams, calculations, etc. relating to mathematics, especially geometry and mensuration, which are conspicuously absent in other commentaries have been explained in a systematic and scientific way long before the advent of European style of interpretation in this regard. He emphasized that such texts are our proud possession of ancient Indian science. Every attempt should be made to collect, preserve, edit and publish these fruits of intellectual tradition.

Session7 (parallel); Committee room 1130-1300: Medical Sciences, Ayurveda, Yoga - II

Chair: Prof. Vinod Kumar Jain, School of Environmental Sciences & Registrar, JNU

Speakers

• R. P. Singh, JNU, Spirituality, logic and science in India- a philosophical reflection

- Kodumudi Venkat Venkateswaran, Radix BioSolutions, Tx USA, Ancient, assured way for Achieving Excellence
- Pandit Ramadheen Ramsamooj, University of Massachusetts, Dartmouth, USA, Vedic methods of learning and cognition

Session Coordinator: Dr. Sanjay Mishra, Queensland University of Technology, Australia Session Rapporteur: Dr. R. Chandrashekar, SCSS, J.N.U.

First presentation was given by Prof R. P. Singh of JNU on "Spirituality, Logic and Sciences in India – a Philosophical Reflection". He discussed different aspects of spirituality like how it comes, is achieved and how all this derives from the Vedas. He mentioned that India has philosophical traditions and not systems which was debated in the discussion. He mentioned some basic differences between the two – for example, the western tradition gives information and Indian tradition gives transformation; western tradition is individual while Indian tradition is integrating. Finally, he gave his classification of Indian traditions and the general features which differentiate these from other world traditions.

The second presentation of the session was by Kodumudi Venkata Venkateswaran of Radix BioSolutions, Texas, USA on "Ancient, Assured Way of Achieving Excellence". Giving brief introduction to the concept of science and technology, he pointed the consequent change in approach from reduction to integrated and interdisciplinary affected by availability of tools and resources. He mentioned that the approach of molecular biology has assimilated with the subjective cure approach of Ayurveda. In the most parts of his presentation, he quoted the *ślokas* of $G\bar{u}\bar{a}$ which describe body parts, composition and organization of body which integrate the explanation of the outer world from the holistic approach while the modern sciences narrow down the area of study. According to him $G\bar{u}\bar{t}\bar{a}$ describes harmonic living. He emphasized understating spiritual texts as indicating something and the things they indicated are different.

The third talk was given by Pt. Ramadheen Ramsamooj from the 3R Foundation, University of Massachusetts, Dartmouth, USA on "Whole Brain Learning, Sanskrit and its Importance in the SALT Model". In the beginning, he described the structure of the brain with the functions each hemisphere deals with. Then he explained the concept of whole brain learning which has adapted the Vedic model. American Vivekananda Academy has its foundation in the Vedic model. He described how 5 levels of Sanskrit learning - sounds, words, sentence structure, intuitive level and yoga (meditation) level make whole brain (both hemispheres) active alternatively. This model reflects and rejects the knowledge which does not have validity. Finally, he explained how some knowledge in memory remains changeable and some knowledge becomes *saṃskāra* and transmitted to cosmos.

Session8 (parallel): classroom #113 1130 – 1300: Mathematical Sciences-II

Chair: Prof Navjyoti Singh, IIIT Hyderabad

Speakers

• K Ramasubramanium, IIT Mumbai, ganita-kaumudi

- Bhudev Sharma, Jaypee Institute of ITU, Noida, *Mathematics and its applications* from vedas and other Sanskrit texts
- Ravi Kulkarni, IIT Mumbai, Outlining parameters for the history of mathematical sciences in India

Session Coordinator: Dr. C. U. Rao, SCSS, J.N.U. Session Rapporteur: Diwakar Mishra, SCSS, J.N.U.

The first presentation was made by Prof. K. Ramasubramanian, Cell for Indian Science and Technology in Sanskrit, Department of HSS, IIT Bombay. He discussed Ganita-Kaumudī which is a Sanskrit text written by Nārāyana Pandit who was one of the leading figures of Indian Mathematics (c. 1350 CE). Date of completion of Ganita-Kaumudī is Nov. 10, 1356 (Saka 1278). Its text was first edited in the 1930's by Padmākara Dvivedi (son of Pandit Sudhākara Dvivedi) and consists of 14 Vyavahāras (chapters). In this presentation, he focused on two chapters - ksetra-vyavahāra (sequences and series) and średhi-vyavahāra (geometry of planar figures). During the explanation of these chapters, he gave examples of mathematical theorems like the cow problem: "A cow gives birth to a (she) calf every year (and) their calves themselves (begin giving birth), in 3 years time. O learned, tell the number of progeny produced by a cow during 20 years." He gave other examples like the 'bamboo problem', 'arrow problem', 'lotus problem', 'cuckoo problem' etc. Concluding his paper, he said that though there is discussion on the construction of trapezium even in *sulbasūtras*, it is Nārayana Pandit who very methodically develops the subject and prescribes rules for the computation of area, altitude, diagonal, abda, etc. Nārāyana Pandit also elaborately discusses how to construct rational trapezium with a given area. Like Brahmagupta, Nārāyana Pandit also gives the elegant formula for the area of cyclic quadrilateral, but with an important difference. The systematically presented text with plenty of illustrative examples should be brought to limelight and is worth prescribing as a text.

The second presentation was made by Prof. Bhudev Sharma, well known scholar of mathematics, currently working with Jaypee Institute of ITU, Noida. His topic was "*Mathematics and its applications from vedas and other Sanskrit texts*" He explained the evolution of mathematics from the vedic texts. He quoted the mantras of *Yajurveda* and *Atharvaveda* which can be said to be the first evidence of numerical progression in the world history. In his presentation, he said that the birth-place of mathematics, specially that of numbers, geometry and algebra is India. Origin of numbers, geometry and sequences & series is enshrined in Vedas. Mathematics developed in Vedic tradition in India and from here went to other parts of the world. Mathematics as a philosophical discipline and as a tool for understanding anything was well understood by Indians. It went to the West through *Arabs* and to the east by traveling individual mathematicians and through its great centers of learning. He told that according to Albert Burke, the original proof of Pythagoras theorem was copied by Pythagoras on his visit to India.

Session9 (parallel): committee room 1400 – 1530: Engineering Chair: Dr D K Lobiyal, School of Computer & Systems Sciences, JNU

Chandrabhan Prajapati, IIT Delhi, *Contribution of ancient India in production technology and mechanical engineering* Girish Nath Jha, SCSS, JNU, *Language engineering and Sanskrit* Premendra Priyadarshi, Delhi, *Mechanics in Hindu literature*

Session Coordinator: Umesh Kumar Singh, Delhi University. Session Rapporteur: Dr. R. Chandrashekar, SCSS, J.N.U

The first presentation was by Chandrabhan Prajapati of IIT, Delhi on "*Contribution of Ancient India in Production Technology and Mechanical Engineering*". In his presentation he gave the facts and evidences which indicate the presence of rich technology of metallurgy and chemical products. The evidences were of different kinds like the historical iron pillar of Ashoka with 98% pure iron, names of metals, alloys and compound chemicals found in the texts, the products exported from India in earlier time, Sanskrit names of apparatus of metal extraction (like blast furnace). These evidences are referred by Greek, Chinese and Arabic historians.

Since Dileep Kumar Kar from IGNA could not come at the last minute, his place was filled by Dr. Girish Nath Jha of Special Centre for Sanskrit Studies, JNU who gave a presentation on *Language engineering and Sanskrit* focussing on the current research and development activities at JNU in this area. He discussed the tremendous potential Sanskrit had for developing smart language processing technologies and demonstrated some the software tools developed by him at JNU.

The third talk was given by Dr. Premendra Piryadarshi from Delhi on the topic "Mechanics in Hindu Literature". At the start of his presentation, he pointed out the reasons for difficulties in finding the textual evidences of technology in ancient India. According to him, these were the destruction of libraries by invasions, unawareness of Sanskrit and science experts of each other's fields. In most part of his presentation, he quoted various $s\bar{u}tras$ which describe different laws of physics. He quoted some western scholar proving that the equations used by Newton (not his laws) were taken from India and Nīlakaṇṭha in Kerala was using them in 14th century. In the discussion that followed, the chair of the session expressed concern that most efforts are being directed towards finding things which have been already invented by western sciences. The effort should be to find new ideas and things in ancient Indian science and technology texts. The chair also emphasized the need for filling the gap between science and language experts.

Session9 (parallel): classroom #113

1400 – 1530: Other Novel Sciences

Chair: Prof. Rakesh Bhatnagar, School of Biotechnology, JNU

Speakers

- Navjyoti Singh, IIIT Hyderabad, <u>Was there science in ancient India? kaaranadravya</u> <u>in prayojana shaastra versus</u> causality in science
- Bharat H Desai, JNU, Select principles of international law in ancient India
- Wagish Shukla, IIT Delhi: Concept of science-building in ancient India

Session Coordinator: Dr. Ramnath Jha, J.N.U. Session Rapporteur: Diwakar Mishra, J.N.U.

The first presentation was made by Prof. Navjyoti Singh, from the IIIT, Hyderabad. His topic was "Was there science in ancient India? kāraņadravya in prayojanaśāstra versus

causality in science". Prof Singh questioned the practice of calling prayojana śāstras 'scientific' and emphasized that they may be instead termed 'novel sciences' or 'futuristic sciences'. He attempted to contrast the notions of causality and logicality in classical *prayojana śāstras* with those of 'modern sciences' to illustrate the point. He took some other concepts from mathematics and logic and demonstrated how they were treated differently in Indian and western traditions

The second presentation was given by Prof. Bharat H. Desai, Center for Law and governance, Jawaharlal Nehru University on the topic "Select principles of international law in ancient India". Prof Desai collected the insightful ideas from Sanskrit texts like the *Arthaśastra* to show how the principles of international law were enshrined in them. Some of the important ones being the law of war discussed in many texts like *Mahābhārata* and *Arthaśastra*

Prof. Vagish Shukla, Indian Institute of Technology, Delhi was the third and last speaker of this session . His topic was "*Concept of science building in ancient India*". Prof Shukla discussed some fundamental concepts and the evolution of sciences in India

Session10 : committee room

1530 – 1700: Panel discussion & future course of action

Topic: India's ancient sciences - what do we have and where to go from here

- Bal Ram Singh, University of Massachusetts, Dartmouth, Panel Coordinator
- Navjyoti Singh, IIIT Hyderabad
- Kapil Kapoor, Jawaharlal Nehru University
- S. P. Narang, Delhi University

Session Coordinator: Dr. Girish Nath Jha, J.N.U. Session Rapporteur: Dr. R. Chandrashekar, J.N.U.

The concluding session was organized in the committee room of Special Centre for Sanskrit Studies, Jawaharlal Nehru University as a panel discussion on the topic "*Indias's ancient sciences –What do we have and where to go from here*." In the beginning of the session, Prof. Bal Ram Singh gave a brief introduction of Centre for Indic Studies, Dartmouth for those people who were not present in inaugural session and mentioned the SATIAT initiative and its progress so far – including the first meeting at Haridwar in June, 2009 then Vedic Science retreat at UMD in November, 2009 and then the association with Dr Girish Nath Jha and Umesh Kumar Singh in taking this further. Prof Singh then invited Prof Kaoil Kapoor t present his views on the topic in brief.

Prof. Kapoor said that the modern western society is known as knowledge society which in his view was incorrect. The label should in fact be 'information society', and the current so called knowledge boom is in fact information boom. He emphasized that, exploring Indic sciences should not supplement but try to be an alternative to the west. Our knowledge culture is an alternative knowledge culture. He gave some illustrations to prove his point. Prof Kapoor said that there were two kinds of imbalances in the west - the imbalance between man and nature and imbalance between man and society. In this way, Indian culture can be an alternative culture. Therefore we should retrieve the knowledge from our traditional texts. He emphasized to rescue the manuscripts and interpret them with the subject experts both scientists and *sanskritists*.

Prof Bal Ram Singh invited suggestions from the audience particularly students and the ideas were noted down. The next speaker was Prof. Narang. He suggested that in such international seminars papers presenting only mysticism and not science and technology should be discouraged. He pointed out that there was no paper related to agriculture though India is a country where agriculture has a major role. He focused to *vrksāyurvda* that it was also a text related to agricultural science but no paper was on this topic.

Again suggestions were invited by Prof. Bal Ram Singh from students then invited Prof. Navjyoti Singh to put forth his views on the topic. Prof. Navjyoti Singh pointed to the *sankucan* (shrinking) of *paramparā* and told a little story about his traditional guru from Pattabhiram Shastri. After the speech of Prof. Navjyoti Singh, Prof. Bal Ram said that though he is Indian but really he is American and he is representing U Mass-D in this seminar. And he informed that Americans are very keen to learn Sanskrit and the want to use the knowledge encoded in Sanskrit. On behalf of America he promised that he will try to bring some science background people to collaborate with Sanskrit centre to explore knowledge of Sanskrit. He expressed happiness at the success of the seminar and the tremendous interest that participants had shown throughout all the sessions. Based on some feedback from some students, Prof Singh said that this activity will be carried forward with more interactions between Sanskritists and scientists. He also said that a series of training workshops will be organized for scientists and Sanskritists.

Conclusion & Vote of Thanks

Dr. Girish Nath Jha from SCSS, J.N.U. presented a summary of the two days of the intense discussions in the seminar and also presented a statistical analysis of topics presented, areas covered and actual time of discussion etc, and pointed out that we will need more papers in some areas which were less represented in the seminar (refer the introduction section for detals).

The seminar ended with a vote of thanks by Dr Jha to the funding institutions, participating institutions, scholars, audience and the faculty, staff and students of the Sanskrit center for making this seminar a grand success.