TRANSITION OF AYURVEDIC EDUCATION: HERMITAGE TO ELECTRONIC AGE

Ala Narayana*   **Saketh Ram Thrigulla****

ABSTRACT

Ayurveda stands on its merit due to its long continuum from the past, and the literary wealth it possesses. Till two centuries back the transmission of knowledge was oral, yet over a period of time many of Ayurveda texts were written down to save them for posterity. Due to the advent of printing technology and revived national interest, few of the important Ayurveda texts were published in the early 19th century. Till recently this trend sustained and gradually, most popular Ayurveda books were brought into light in the form of printed books. Due to the rapid, wide spread usage of information technology across the globe novel media for preserving printed data came into existence and digitalization of printed books was taken up on a large scale across the world. This resulted in converting many popular *Ayurveda* books into digital form predominantly in PDF or scanned images. These media have limited scope in terms of usability as many of them are not capable of text search or copying options. The solution for this problem is Electronic Books (E-books) which present electronic text in structured manner which is readable on computers. Such applications have the advantage to do multiple search, copy the text and come with extensive hyper linking which enables the user to access to additional material with ease and efficiency. There are discrete attempts to provide Sanskrit classic/ *Ayurveda* texts in electronic form across the world but they did not match the actual spirit of E-books. After studying the problem thoroughly, National Institute of Indian Medical Heritage (NIIMH) has developed expertise in producing high quality Ayurveda E-books which are computer operating system (OS) independent and user-friendly. The background of large volume of medical knowledge in Sanskrit, phases and lineages of Ayurveda from past to till date, the changes in Ayurvedic education, teaching/training methods and learning materials from time to time, exploiting the information technology for the benefit of modern Ayurvedic learners is discussed here.*

*Director, **Research officer (Ayurveda), National Institute of Indian Medical Heritage (CCRAS), Gaddiannaram, Hyderabad - 500036.

Introduction:

The journey of *Ayurveda* through the ages is very long, dynamic and varied. During its long and varied history, there are additions of new theories and practices to the established ones, their interrelations and the interweaving of medical thought with constantly mutating religious, political, and cultural climates, form a rich and complicated pattern of medical and social history. The roots of Ayurveda are very deep as evident from the culture and day to day life of people of Indian subcontinent and Far East Asia. Now it is going places and slowly impacting the thought process of people who are unaware of such concepts till recently. *Ayurveda* has its presence felt across the world today. Due it is the transnational and multicultural phenomenon, Ayurveda's interface with modernity and the pluralistic approaches[1] have resulted in new methods of presentations of its corpus of written information.

The lineage of Ayurveda during the Ancient time:

(Education, Practice of medicine in the historical context)

Ayurveda is considered as an upaveda of *Atharvaveda*[e] and its origin are generally attributed to *Brahma* in the classical literature. The paradoxical setting of explanation given to origins of Ayurveda, where the lineages are portrayed to begin with divine origin viz., Brahma passing the knowledge via *Dakṣaprajāpati, Aśvins, Indra* and finally to mortals through Sage *Bharadvāja*.[b] The background setting of this was the deteriorating health conditions of people, which was duly discussed during a seminar at the foot of Himalayas, which ultimately lead to the consolidation of erstwhile scattered medical knowledge into *Ayurveda*.[c] It is very interesting to note that the derogatory effect of people leaving the active nomadic life and settling down in permanent settlements and consequences on the health and longevity are vividly portrayed while opening the discussion in the chapter titled Ayurvedasamutthānīya in *Carakasaṁhitā*.[d] This establishes the vividness of propounders of Ayurveda in their meticulousness to postulate the science of life i.e., in response to the genuine health care needs which is by a choice and not by merely a chance.

a. Carakasaṁhitā, sūtrasthāna, 30/21
b. Carakasaṁhitā (E-book), sūtrasthāna, 1/ 4-5.
c. Carakasaṁhitā, sūtrasthāna,. 1/ 6-23 : The Ayurveda Symposia to discuss about the socioeconomic consequences of Morbidity.
d. Carakasaṁhitā (E-book), cikitsāsthāna 1 (4)/ 3-5 The problems arising out of switching over to sedentary life from active nomadic life, the resultant morbidity and Ayurveda as a solution for the same are discussed.
e. Originally postulated in a. Bahulkar, S. S. 1994. Medical Ritual in the Atharvaveda Tradition. Shri Balmukund, Sanskrit Mahavidyalaya Research Series No. 8. Pune: Tilak Maharashtra Vidyapeeth.; 2000. b. Zysk Kenneth, G Asceticism and Healing in Ancient India. Medicine in the Buddhist Monastery (Indian Medical Tradition II). 1st ed. 1991. Delhi: Motilal Banarsidass.

The classical lineages of Ayurveda from the historical perspective are best narrated in the following passage quoted from the book Modern and Global *Ayurveda*. Ayurveda has antecedents in the medicine found in much earlier periods in India, and in texts as far back as the Atharvaveda of around 1000 BCE.[e] However, systematic medical theory began to be formulated only around the time of the Buddha (ca. 400 BCE).

It is in early Buddhist texts that we first find explicit statements that disease arises from an imbalance of humoral substances, an idea that would become a cornerstone in Indian medical theory'.[2]

Ayurveda as anvīkṣakī- The Science of logical understanding:

Sāṅkhya, Yoga, Lokāyata (the system of materialism as taught by *Cārvaka*) these together constitute *anvīkṣakī*, the science of logical understanding. Investigating, by means of reasoning, what is spiritual good and evil in the vedic lore literally, three vedic texts of *ṛgveda, yajurveda*, and *sāmaveda*. Material gain and loss in the science of economics, good policy and bad policy in the science of politics as well as the relative strength and weakness of these three branches of knowledge themselves, this science of logical understanding of the phenomena that the world confers benefit on the people, keeps their mind steady in adversity as well as prosperity and brings about a proficiency and an expertise in their thought, speech and action.[3] The science of Logical understanding or Rationalism is ever considered therefore to be the very lamp of all the fields of formal learning, the very means of accomplishing all activities and the support of all laws and an expertise in their thought, speech and action.[a],[4] *Carakasaṁhitā* is considered as an reliable source of *sāṅkhya* which is a premier book on Ayurveda. More so, Ayurveda is a secular discipline and must be considered as an anvīkṣakī (logical) body of knowledge owing to its practical day to day utilization till date. The spirit of logic is the source of design of Ayurvedic content throughout the history.

Criteria of excellence adopted to write technical treatises

Ayurveda has two components of training, such as: one theoretical knowledge, second the practical training. The former is achieved through rigorous recitation, memorization and assimilation of contents from a stipulated treatise from a teacher. A treatise intended for this purpose must have the following features: Arrangement of subject matter, maintenance of proper connections, completeness in all respects, sweetness in nature, exaltedness and lucidity constitute the excellence in writing. Among them, keeping up connection of the

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a.   Kautilya's Arthashastra, 1.2, 11, 12.
b.   Criteria of excellence adopted to write technical treatises; quoted from: Kautilya. Arthashastra, 2. 6-12.

text, proper arrangement of the subject matter in hand, made possible by stating in consonance as it happens, placement of the principle meaning in the very beginning itself. Absence of deficiency or excess of matter in question by means of all the necessary reasons, citations and illustration as natural - this, is completeness in all respects. The use of words with a charming, meaning (that are also) easily conveyed - this, is sweetness. The use of words that are not vulgar is exaltedness. The employment of words that are well-known is lucidity. [b, 5]

Practical training and learning in *Ayurveda*

Constant application of theoretical knowledge to the context, being very attentive and constant interaction with peers is the cornerstone of gaining practical knowledge. The entire world is a teacher to the intelligent and an enemy to the unintelligent. Hence, considering everything well, you shall listen as well as practice even from your enemy as he teaches words that are commendable, face securing, life giving, nourishing and popular.[a, 6]

Classical guidelines for preparation of the treatise for study

The prospective intelligent student of *Ayurveda* who decides for him/herself suited for the medical profession after an appraisal of the task according to the following criteria:
a.   Whether such education will prove difficult or easy for livelihood and learning.
b.   The consequences and the obligations that will ensue if he/she takes up such a career.
c.   The time at his disposal and the place at which he is located.

Once the student is sure of these criteria a specific Treatise of the science, as suggested by the masters has to be opted. The characteristic features of such Treatise are: Treatise which has obtained great fame and has been approved by the wise men; comprehensive in scope; held in esteem by the trust-worthy authorities; suitable alike for the understanding the three grades of students (very intelligent, moderate, and slow); free from the faults of repetition; classical (lit. revealed by a seer); arranged in well-written sequences of aphorisms, explanations and summaries; well authenticated; free from vulgar usages and concerned predominantly with determining the true nature of the things (rather than the mere trivia or just the details); relevant to the theme; orderly (lit. unconfused) in its (presentation of the) topics; immediately elucidatory; and enriched (lit. endowed) with definitions and illustrations. For, a Treatise of this type, like the clear, unclouded sun illuminates everything (it deals with) dispelling the darkness (from the minds of its readers.).[b, 7]

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a.   Practical knowledge over theoretical knowledge quoted from: Carakasaṁhitā, vimānasthāna, 8/14.
b.   Choice of text for majoring medicine, quoted from: Carakasaṁhitā , vimānasthāna, 8/ 3.

Day to day study schedule:

Ayurveda texts clearly narrate the day to day activity of a student intended for accurate learning. The details are as follows: The student who is healthy and has (fully) consecrated his time for study should rise at dawn or while yet a portion of the night is left and having performed his necessary ablutions and having saluted the gods, the sages, the cow, the wise men, the teachers, the adepts and the preceptors and seating himself at ease on an even and clean ground, should with all concentration of his mind on his own utterance, go over the aphorisms in order, repeating them over and over again, all the while understanding their importance clearly in order to correct his own faults and to recognize the measure of faults of others. In this way, at noon, afternoon, and in the evening he should constantly practice his study without wasting time.[a, 8]

Contemplating on the material and attitude of the students for further improvement:

Once the student completes the learning of entire Treatise, he/she should for the sake of strengthening technical knowledge, strive constantly and well to perfect him/herself in the excellence of his/her nomenclature (viz. to classify and name diseases, medicines, etc.) special knowledge of the meanings (of the Textual statements) and the capacity of verbal exposition (of his own expertise).[b,9]

Classical method of reading, learning and teaching Ayurveda treatise:

Ayurvedic texts are composed in Sanskrit language and large portions of the text is in the form of metered verse and sutra (formulaic) form. There is certain method to extract meaning out of such verses and the Teacher and student has to cherish close association and constant interaction to achieve the same. The following description of deciphering the meaning from Ayurveda texts is described: 'Oh! Student, reflect well on how to study the śāstra, as I tell you. The teacher should teach one word, a quarter or a full stanza (śloka) to the best of his power. The student should come properly dressed (*kṛtōttarāsaṅgāyā*), should have no distraction and should be sitting near the teacher. These words, quarter and the stanzas should all be scrutinized in this way gradually one by one and in abundance (i.e., repeatedly). In this way the teacher should bring the complete organization of the whole Text himself and also make the student read along with him and formulate this totality finally in his own mind. One should read neither fast, nor slow, neither hesitantly nor nasally. Every sound should be uttered very clearly and this sound should not be

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a.   Method of systematic study quoted from: Cs.vi.8.7.

b.   The attitude of the student during and after learning a treatise, quoted from: Carakasaṁhitā, vimānasthāna, 8/5.

c.   Reading and understanding Ayurvedic classical treatise., quoted from: Suśrutasaṁhitā,sūtrasthāna., 3/ 54-56

accompanied by any distortion or gesticulation, rolling of the eyebrows, shaking of the lips or moving hither and thither of the hands. It should be well cultured, neither very high nor very low. When the teacher and the student are studying, none should walk in between. The loyal student should continue to put the due effort till he reaches the end of the study,- in

i.   The elegance or speech,
ii.   Sound knowledge of the meaning,
iii. Proficiency,
iv.   Skill in operative procedures, and practicing them all as well as in attaining the success[c, 10]

Inter-disciplinary interaction - methods of discussion:

Suśrutasaṁhitā instructs a medical student to participate in technical discussion as frequently as possible. The following narrative provides the rigor with which teachers of Ayurveda have engaged themselves in the art of discussion which has resulted in the scholarly literature in Ayurveda. 'Even if the student understands what they study, it should be talked about with colleagues and experts. It should be carried out with all the explanations that are needed for the occasion. Otherwise, the study will just be a labour done in vain like the load of sandalwood on a mule. For, the mule can appreciate the weight of the load alone and not the fragrance of the sandalwood. [a, 11]

Brilliant description of benefits of technical debate and know-how is narrated very clearly in *Ayurveda* texts. The methodology of healthy debate in expert symposia is as follows:

a. Benefits of Discussion:
i.   Attainment of knowledge along with pleasure
ii.   Bring about a real expertise among the participants.
iii. Confer the dialectical skill and illuminate the fame intensively.
iv.   Remove the doubts.
v.   Hints at new meaning that has not been heard at all earlier.
vi.   Adds new information to already learned material.[b, 12]

b. Methods of discussion- Two types of discussions:
An expert discussion with the peers (of the same branch of science) is of two kinds - a friendly or a conciliatory discussion and a discussion of challenge or an aggressive (hostile) discussion. A conciliatory discussion is prescribed to be carried out only with a person who

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a.   Rigor of discussion and importance of cultivating the habit of participation in discussion/ debate, quoted from: Suśrutasaṁhitā, sūtrasthāna, 4 3/5.

b.   Methods of organizing Expert symposia, quoted from: Carakasaṁhitā, vimānasthāna.,8/15.

is himself endowed with the knowledge and the experience of the subject in question, versed in the dialectics of statement and rejoinder, does not get angry and is genuine and insightful in his learning, non-carping, easily persuaded and is (himself) an expert in the art of persuasion, and has tolerance to troubles and pleasantness of speech. When talking with such a person, one should talk confidingly (i.e. in all trust and faith) and even question confidingly. When one is (in turn) questioned thus confidingly, one should tell out the meaning as he understands it clearly. One should not be afraid of discomfiture and having discomfited another, one should not rejoice. One should not boast before others, nor should be prejudiced and single tracked because of one's own delusion in the matter. One should not try to expatiate inordinately upon what is not known to one self. One should persuade gently and in a spirit of goodness and one should pay great heed to this specific injunction in civility. This is the methodology of discussion in a natural direction.[a, 13]

The hostile discussion without reasoning has no place in Ayurveda. Only the lineage which has proper *Ācārya* (teacher) and student continuum supported by adequate written literature and practical paraphernalia will sustain for the posterity. Luckily with all the turbulence and hardships Ayurveda has survived till date in spite of insurmountable losses to it from time to time. This lineage of pre modern Ayurveda continued till advent of European arrival, specially the British. The latter's arrival has brought in great changes in shaping the future of *Ayurveda.*

The lineage of *Ayurveda* during the Pre-modern time was limited to guru-shishya paramparā i.e., the teacher imparting education directly under strict personal guidance. Though it was a limited way of disseminating the benefits of *Ayurveda,* it was catering to the needs of then society at least partially, and the rest was carried out with the non-expert knowledge of the people who were mostly self governed. The discussion so far establishes the fact that *Ayurveda* is an *anvīkṣakī-* The Sciences of logical understanding and the treatises written for the same adhered to very strict scientific narration. This is evident from the guidelines laid down for the preparation of text books of medicine, and the methods of imparting in the form of: Day to day study schedule; Contemplating on the learned material and attitude of the students for further improvement; Classical method of reading, learning, and teaching Ayurveda treatise; Inter-disciplinary interaction and method of discussion. On the whole, in spite some of the losses (traditions, books) Ayurveda survived fairly well till pre-modern period i.e., British rule in India.

The following passages look at how radically the changes have occurred in the way, Ayurveda is perceived, nurtured and modified to fit into the paradigm of British Empire and

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a.   Carakasaṁhitā, vimānasthāna, 8/16.17

further its impact on shaping up of the future of Ayurveda as we see it today.

The lineage of *Ayurveda-* Modern-Pre independent India:

Prior to British supremacy the Indian systems of medicine had an independent cultural ethos and ideology and were the mainstay of medical and health care. They were not influenced by political upheavals and nor did they depend on state patronization- although it was often extended by the Mughal dynasty and later by several provincial rulers after the decline of the Mughal Empire.[14]

The later phase of lineage show cases a love hate interaction between Occidental and Oriental systems of Medicine. Four phases[15] of interaction are quoted here:

1. Phase-1-From the earliest voyages of the Portuguese until around 1670: This phase is characterized by willingness to learn from Indian medical systems, which were in some respects, seen to be on par with the learned medicine of the ancients; Both Europeans and Indian shared a similar view of human body as being composed of elements or humors (the exact number depending upon the system)

2. Phase-II -1670-1770: Initial respect, though still evident, was beginning to disappear as a consequence of advances in European medicine, anatomy and natural philosophy, and especially William Harvey's work on the circulation of blood, expansion of formal medical education at the universities of Leiden and Edinburgh, and the impact upon medicine of Newton's mechanics and ultimately the demise of humoral medicine in Europe. European medicine appeared to be superior in every other department. Western medicine was 'scientific', and based on reason and observation; whereas Indian systems of medicine seemed slavishly to follow tradition and were intermingled with priest craft and superstition.

3. Phase-III -1770-1820: The third phase brought the first attempts to record systematically indigenous medical practices- a direct consequence of territorial expansion and the consolidation of imperial rule.

4. Phase-IV: The fourth phase is the phase where the gulf between oriental and occidental has widened irreparably: This period has resulted in complete discordance of the competence of Indigenous medical knowledge and was never after accorded the respect it could have deserved. It was always a matter of local governments and was never a priority for British rulers.

However some of the foundation stones for future course of regularization of Ayurveda were laid down during this period. The details are follows: The establishment of the All-India Ayurveda Mahasammelan (Ayurvedic Congress) in 1907 was a landmark in this respect,

though it originally understood itself as the representative body of all practitioners of indigenous medicine, including Unani and Siddha. The Bombay Medical Practitioners' Act of 1938, which established the first separate register for practitioners of Indian systems of medicine, was the first formal recognition of *Ayurveda* by the government of India.[16]

Post independence lineage:

After Independence, further important formal structures were set up with the Central Institute of Research in Indigenous Systems of Medicine in 1956, followed by the Central Council for Ayurvedic Research in 1959, the Central Council of Indian Medicine in 1971, and the Central Council for Research in Ayurveda and Siddha in 1978. In 1982, the Central Council of Indian Medicine issued the first comprehensive regulations regarding standards of professional conduct and etiquette and a code of ethics for practitioners of Indian medicine. In 1995, a Department of Indian Systems of Medicine was established, with a permanent secretary within the Indian Ministry of Health and Family Welfare.[17] The department is renamed as department of AYUSH in 2003. The term AYUSH is an acronym denoting Ayurveda, Yoga&Naturopathy, Unani, Siddha and Homoeopathy.

Modern Ayurveda

'Modern Ayurveda' is term coined to depict its avatar in 20th century. The hall mark feature of modern Ayurveda is nineteenth-century revivalism as quoted in Modern and global Ayurveda by Leslie 1998; Brass 1972; Jeffery 1988. Modern Ayurveda is characterized by a tendency toward the secularization of Ayurvedic knowledge and its adaptation to biomedicine and at the same time by attempts to formulate a unitary theory based on doctrines found in the classical Ayurvedic texts.[18] Modern Ayurveda does in some respects resemble the Ayurveda found in the bṛhattrayi (classical triad) which is to say in the first half of the first millennium CE, in many ways it does not, and most of this is the result of internal developments and refinements in medical knowledge, a changing ecology, and the influence of ever-changing indigenous religious and cultural forms.[19]

The lineage of Global Ayurveda:

'Global Ayurveda', refers to Ayurvedic knowledge that has been transmitted to geographically widespread areas outside of India.[20] Dagmar wujastyk et. al., go on to narrate three sub-lineags of global Ayurveda which are: 1. Spread of Ayurvedic pharmacopoeia; 2. New Age Ayurveda; 3. A third, independent line of global Ayurveda originated in the context of the then-new scholarly discipline of Indic Studies in the early nineteenth century, when Orientalist scholars began to take interest in Ayurvedic literature, scholarly editions and translations of Sanskrit medical works have been important contributions to formalized

Ayurvedic education and research.[21] However, scholarly publications on Ayurveda reach only a limited number of readers, much less than comparable publications from new-age and other public-oriented sectors. The lack of such reach is the motivation behind taking up projects like e-books which ensure wider dissemination of information.

The corpus of Ayurvedic knowledge in the changing perspective:

There is a huge corpus of written literature and a long continuum of living traditions, which are the real strengths of *Ayurveda*. The literature of *Ayurveda* is not merely a collection of anecdotal poetic / literary information, it is indeed the 'arrangement of the codification of medical knowledge, the summarization, the assertions or propositions, the causes, the illustrations (examples), the applications and the deductions in such a way that all this is understandable by three types of intellects (dull, intelligent and the genius) which is arranged in the form of written text' i.e. the *samhitas*.[22]

Empirical, Secular character of Ayurvedic knowledge and acceptance by different religious and cultural groups:

In the article titled 'Overview of the Education and Practice of Global Ayurveda' the authors Dagmar Wujastyk, Claudia Welch (2008) argue that[23] 'the overwhelming bulk of material in the classical texts addresses the more empirical aspects of *Ayurveda*, including complex recipes for medicines, detailed descriptions of treatments, delineation of disorders, full accounts of a variety of diagnostic procedures, and in the case of Suśruta even surgery (which is still practiced effectively in a few places in India). And, it is important to note, it is common to find[24] Ayurvedic practitioners who emphasize this empirical medicine and who may minimize or ignore entirely the spiritual aspects of the texts. This is visible in high-volume practices in India and in parts of South India, where Christian and Muslim practitioners of *Ayurveda* who may not easily relate to the Sanskritic contexts of Ayurveda may be found in relatively large numbers.

The lineage of *Ayurveda*, in the modern-pre independent India has shaped Ayurveda as a reaction to the step motherly treatment it received, which was mostly supported by self-help groups, and few Indologists who were interested in literary aspects of *Ayurveda*. In the post independence lineage, the disparity continued till 1970s with further more marginalization of *Ayurveda*. Slowly after that it started receiving the patronage and by 80s it started getting the momentum, kick started by what is known as Global Ayurveda. By flag end second millennium, thanks to the efforts of Department of AYUSH, things got more rationalized in terms of Ayurvedic Medical education, Service to people, mainstreaming of AYUSH systems allowing wider, deeper penetration of these medical systems into mainstream medical care.

Thanks to the empirical, secular character of Ayurvedic knowledge, acceptance by different religious, cultural groups and its presence through out the globe, the presentations in the corpus of Ayurvedic knowledge according to the changing contexts has become the need of the day. The following passages throw light on what was available, and what is in the offering with respect to Ayurvedic literature to the Global Ayurvedic patrons.

Current scenario of resources of Ayurvedic literature:

Thanks to the efforts of Ayurvedic and Indology scholars from early 18-19th century, many of the major works of Ayurveda which have survived till then have been brought as printed books. Earlier to this most of them were either orally transmitted or written on Palm leave, Paper manuscripts and others. The printed books are at the fore front of this medium followed by manuscripts of different types (paper, palm-leave etc.,) scattered across various libraries in India and abroad. In general, these resources are available to limited number of users who are either keen enthusiasts of *Ayurveda* or scholars who are specifically working in this domain. Due to the limited access and difficulty in procuring them in time has developed into a big barrier in working with such resources, which is slowly leading to fewer people opting for serious literary or applied research based on Ayurvedic sources.

New sources of presenting Sanskrit and Ayurvedic literature

We are in the 21st century and whole world has been transformed in term of how we use the literary resources. Due to huge advancements in information technology segment in terms of availability many printed resources in digital form. Thanks to the huge projects like: Million books project[a] (led by Carnegie Mellon University), Digital Library of India (DLI)[b], Sanskrit books in electronic form by Rāṣṭrīya saṁskṛta saṁsthān,[c] and others many Sanskrit/ Ayurvedic printed books are now available in the form of PDFs/images of scanned texts.

The younger generation of Ayurveda enthusiasts, scholars are tech savvy, and are already using such resources widely to enrich their knowledge. This is only part of the whole requirement. The PDFs or Images of printed books which are in digital form pose

a. http://archive.org/details/millionbooks is the web site to view the digital books across the world.
b. Digital library of India has is collaborator for Million books project and has biggest collection of digital books in India. The link for site is : http://www.dli.ernet.in/
c. Rāṣṭrīya saṁskṛta saṁsthān, Delhi is a Deemed university under the patronage of Government of India dedicated for propagation and preservation of Sanskrit learning India . Different centers the university across India have done good amount of work in bringing out Electronic texts of Sanskrit which are provided in PDF format, they can be sourced from here: http://www.sanskrit.nic.in/ebook.htm
d. http://www.sanskrit-lexicon.uni-koeln.de/ : This web page provides access to some of the Sanskrit lexicons prepared by the Institute of Indology and Tamil Studies, Cologne University. A 1997 review of the Cologne Digital Sanskrit Lexicon project.

many problems in terms of readability due to large data size, inability to do text search and copy the relevant information and copy the same for different purposes. Text in electronic form is the solution for this problem.

The technology has now become cost effective and has advanced enough to cater to peculiar needs of oriental technical corpuses like *Ayurveda.* There have been scattered attempts to bring out literature of Sanskrit in digital form and it make available for the public domain.

There are quite a number of Sanskrit books which are available in Electronic text format. Some of the best examples for such works is Cologne Digital Sanskrit Dictionaries which has completely digitized Monier Williams Sanskrit-English Dictionary and provided online.[d]

Other sources of Sanskrit electronic texts include, GRETIL- Gœttingen Register of Electronic Texts in Indian Languages, (GRETIL - Gœttingen Register of Electronic Texts in Indian Languages is dedicated portal for Indological materials from Central and Southeast Asia: http://www.sub.uni-goettingen.de/ebene_1/fiindolo/gretil.htm8) Digital Corpus of Sanskrit (DCS, the Digital Corpus of Sanskrit, is a searchable collection of lemmatized Sanskrit texts. It offers free internet access to a part of the database of the linguistic program Sanskrit Tagger, which has been under constant development since 1999. The site is available here: http://kjc-fs-cluster.kjc.uni-heidelberg.de/dcs/index.php)

There are many other such works online which are immensely helpful to people who are in need of such resources. In case of Ayurveda there are few discrete attempts made earlier by agencies like Maharishi Ayurveda, which has provided bṛhatrayi (major works-*Carakasaṁhitā, Suśrutasaṁhitā, Aṣṭāṅgahṛdaya, Aṣṭāṅgasaṁgraha*), *laghutrayi-*(supporting texts-*mādhavanidāna, śārṅgadharasaṁhitā, bhāvaprakāśa*) and few other Ayurvedic texts in *Dēvanāgari* script in PDF form. The limitation of this work was key word search and inability to select and copy the needed portion of the text. Other such attempts in this direction were:

1. Triskandhakōṣa (Tilak Maharastrha Vidyapeeth, Pune): Ayurvediya-Triskandha-Kosha Project, deals with he knowledge about the causes, the symptoms, the treatment pertaining to health & diseases. The work was conceived by the Late Vaidya M. V. Kolhatkar and successfully completed by his successor Vaidya Dilip P. Gadgil, Tilak Maharashtra vidyapeeth, Pune. The work used computer algorithms to publish the work in 3 parts and 2 CDs. (http://www.tmv.edu.in/santripro2.asp).

2. Ayusoft (CDAC Pune).

3.17 rasaśāstra e-books under the title rasavidya by O. Hellwig (The project Rasavidyā is the first systematic study of the material culture of medieval Indian alchemy. This website presents the alchemical corpus on which this study is based (links 'Query' and 'Texts') and the descriptions of alchemical procedures which are coded in a a newly developed language model (links 'Noun ontology' and 'Verbal ontology'). http://www.sanskritreader.de/rasavidya/index.php?contents=texte&lng=en).

4.Online Indexing of Ayurveda (The 'Online Indexing of Sushruta Saṁhitā' was completed as part of M.Phil. research submitted to Special Center for Sanskrit Studies, JNU in 2011 by Rajneesh Kumar Pandey (M.Phil 2009-2011) under the supervision of Dr. Girish Nath Jha. The coding for the application was done by Dr. Girish Nath Jha. http://sanskrit.jnu.ac.in/ayur/index.jsp), Amarakośa vanauṣadhivarga and Bhāvaprakāśanighaṇṭu Indexedg by Girish Nath Jha and team from Special center for Sanskrit studies, Jawaharlal Nehru University-JNU, Delhi. (The 'Vanaushaadhi-varga of Amarakosha: A computational study' was completed as partof M.Phil. research submitted to Special Center for Sanskrit Studies, JNU in 2011 by Baldev Ram Khandoliyan (M.Phil 2009-2011) under the supervision of Dr. Girish Nath Jha and Prof. Yamini Bhushan Tripathi (BHU). The coding for the application was done by Dr. Girish Nath Jha. http://sanskrit.jnu.ac.in/bpnighantu/search.jsp)

Need for newer forms of Ayurvedic learning materials: a policy outlook.

Sh. Shailaja Candra, former secretary of Department of AYUSH, in her report titled 'Status of Indian medicine and folk healing-With a focus on benefits that the systems have given to the public' has suggested the following major recommendations with respect to providing most relevant forms of Ayurvedic learning materials suitable for current times, which are: [25]

♦   To encourage the writing of new textbooks with multidisciplinary authorship.

♦   A list of teaching aids should be prescribed as essential for all colleges because a substantial part of the teaching was reported to be following rudimentary methods.

♦   The creation and use of audiovisuals, you-tube and video lectures needs to be encouraged.

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a.   UNESCO definition of Book (1964): http://portal.unesco.org/en/ev.php-URL -ID=13068&URL-DO=DO-TOPIC&URL-SECTION=201.html, Recommendation concerning the International Standardization of Statistics Relating to Book Production and Periodicals , 19 November 1964, II. Book production statistics, Definitions 6 (a).

b.   UNESCO definition of Book (1985): UNESCO revised recommendations concerning te international standardization of statistics on the production and distribution of books, newspapers and periodicals. (1985). Paris: Unesco. Definitions 11 (a). (http://portal.unesco.org/en/ev.php-URL-ID=13146&URL-DO=DO-TOPIC&URL-SECTION=201.html)

♦ The website of Department of AYUSH and subsequently the new All India Institute of Ayurveda and the National Institutions should display the management of most procedures step-by- step.

♦ Funds should be allocated for the establishment of an educational portal or a Virtual Resource centre including its updating and maintenance. This portal should cover the practical aspects of the ASU curriculum particularly where procedures have to be observed step-by-step.[26]

The recommendation of setting up of a portal covering the practical aspects of Ayurveda, Siddha, Unani (ASU) curriculum is possible only through interactive E-books which needed to be produced with all the essential requirements in mind. The article tries to provide the efforts put forth by National institute of Indian Medical Heritage, pioneering institute in bringing in the best of Information technology to Ayurvedic domain. The institute has already produced many E-books. AYUSH Research portal, the one stop research portal to browse research works pertaining to AYUSH field, has been designed, developed and maintained by this institute under the aegis of Central council for research in Ayurvedic sciences, AYUSSH department, Ministry of health and family welfare, Government of India.

What is a book?

In accordance with the 1964 UNESCO recommendation[a] and a later revision in 1985,[b] the book is defined as a 'non-periodic publication of at least 49 pages exclusive of the cover pages, published in a particular country and made available to the public'. This definition was adopted in the ISO 9707:1991 with a note saying that 'Within the International Standard Book Number -ISBN system, books include microfilm and mixed media publications. [27]

What are e-Books

An Electronic book is defined as follows: 'An electronic book (variously, e-book, ebook, digital book, or even e-edition) is a book-length publication in digital form, consisting of text, images, or both, and produced on, published through, and readable on computers or other electronic devices.' [28]

An alternate definition of an E-Book provided by Reitz, 2007, [29] which mostly take into account the way of their production and usage, is as follows:

'Electronic book: A digital version of a traditional print book designed to be read on a personal computer or an e-book reader (a software application for use on a standard-sized computer or a book-sized computer used solely as a reading device' [30]

With the advent of ISBN system more of non-print, digital material also was being considered for accession and finally the E-Books got the legitimate status on par with

printed books and the coinage of the term E-Book and the usage of the same got more and more accepted throughout the world. [31]

E-book formats

Widely available E-book formats include Portable document format-PDF, by Adobe; books which are complying with Open eBook format,a defining required subsets of Extensible Hyper Text Markup Language-XHTML and Cascading Style Sheets (CSS)-CSS; a set of multimedia formats (others could be used, but there must also be a fallback in one of the required formats); and an Extensible Markup Language (XML)- XML schema for a 'manifest', to list the components of a given e-book, identify a table of contents, cover art, and so on. Google Booksb has converted many public-domain works to this open format.

Pioneering attempt of NIIMH- Ayurvedic e-Books:

National Institute of Indian Medical Heritage, Hyderabad, a constituent of Central Council for research in Ayurvedic Sciences (CCRAS), which has the mandate of basic/fundamental research, has been working relentlessly to digitize the Ayurvedic texts, bring out e-Books, the first produce of these efforts were released during 2008 and the following books have been designed developed so far.

a. Open eBook format: Open eBook (or OEB), or formally, the Open eBook Publication Structure (OEBPS), is a legacy e-book format which has been superseded by the EPUB format. It was 'based primarily on technology developed by SoftBook Press'and on XML. http://en.wikipedia.org/wiki/Open-eBook

b. Google Books (previously known as Google Book Search and Google Print) is a service from Google Inc. that searches the full text of books and magazines that Google has scanned, converted to text using optical character recognition, and stored in its digital database http://en.wikipedia.org/wiki/Google-books and http://books.google.com/

S. No.	Name of the book	Year of publication
1	e- book Ayurvedic Pharmacopeia of India Part-I, Volumes I-Va	2008
2	e- book Ayurvedic Pharmacopeia of India Part-II, Volume-I	2008
3	e- book Ayurvedic Pharmacopeia of India Part-II, Volume-II	2008
4	e- book Ayurvedic Formulary of India Part-I & Part-IIb	2008
5	e- book Siddha Pharmacopeia of India Part-I, Volume-I	2008
6	e- book Ayurvedic Pharmacopeia of India Part-I, Volume-VI	2010
7	e- book of Carakasaṁhitā (with Cakrapāṇidattaviracita āyurvēdadīpikā commentary)	2010

8   *e- book of Suśrutasaṁhitā*
        (with śrī ḍalhaṇācāryaviracita, nibandhasaṅgrahākhyavyākhya;
        śrī gayadāsācāryaviracita nyāyacandrikākhyapañjikāvyākhyayā)   *2010*
9.   *e-book Mādhava Nidāna*
        (with śrīvijayarakṣita-śrīkaṇṭhadatta viracita madhukōśavyākhyayā,
        śrīvācaspativaidyaviracita ātaṅkadarpaṇavyākhyayā)   *2012*
10   *e-book Hand book of Domestic Medicine and Common Ayurvedic*
        Home Remedies   *2012*
11   *e-book Nighaṇṭu (collection of 25 Ayurvedic Lexicons)*
        1. Abhidhānamañjarī, 2. Abhidhānaratnamālā , 3. Amarakōśa,
        4. Aṣṭāṅganighaṇṭu, 5. Kaiyadēvanighaṇṭu, 6. Camatkāranighaṇṭu,
        7. Dravyaguṇasaṅgraha, 8. Dhanvantarinighaṇṭu, 9. Nighaṇṭuśēṣa,
        10. Paryāyaratnamālā, 11.Bhāvaprakāśanighaṇṭu,
        12. Madanapālanighaṇṭu, 13.Madanādinighaṇṭu,
        14.Mādhavadravyaguṇa, 15.Rājanighaṇṭu, 16.Rājavallabhanighaṇṭu,
        17.Laghunighaṇṭu, 18.Sabdacandrikā, 19.Sivakōṣa,
        20.Sarasvatīnighaṇṭu, 21.Siddhamantra, 22.Siddhasāranighaṇṭu,
        23.Sōḍhalanighaṇṭu, 24.Sauśṛtanighaṇṭu, 25.Hṛdayadīpakanighaṇṭu.   *2012*

a.   The Ayurveda Pharmacopoeias (8 volumes published so far) are statutory publications to notify the safety standards for raw, finshed goods manufactured according to Ayurveda.

b.   The Ayurvedic formulary of India published in two volumes provide the Government of India approved standard manufacturing procedure for different Ayurvedic dosage forms.

c.   Hand book of domestic medicine and common ayurvedic remedies. (1978) very popular and authentic book which serves the needs of laymen and doctors alike was published by Central Council for research in Ayurvedic Sciences (CCRAS). The book has been reprinted many times owing to publich demand and is translated into Hinid, Telugu and Urdu for wider dissimination.

The technical effort and innovation:

Pre- requisites for Converting Ayurvedic texts to Electronic format.

The contents and text in Ayurvedic books especially Saṁhitas (the major works) are arranged in the following format:

A.   Reproduction of the text from printed books without typographical errors:

Each book is divided in to parts known as '*Sthāna*'; each sthāna is further divided into chapters (*Adhyāya*); the matter according to the theme is arranged into topics and subtopics

(*Adhikarana*). For example *Carakasamhita* has eight *sthānas*-parts, 120 Adhyāyas -chapters and many topics- Adhikarana as per subject of each chapter. While preparing the E-book the first challenge was to key- in (type) the entire text into electronic format without minimum typographical errors. The text was in '*Dēvanāgari*' and complete keying was carried out using an in-house built web based application 'enc_pad', where the entire text was typed in phonetic-English which was readily convertible to *Dēvanāgari* script for further proof reading and correction. A strict three tire collaborative editing model was adopted to minimize the typographical mistakes.

B. Schema design:

Once the text was ready the entire text was tagged with a specific XML schema designed for Ayurveda e-Books, which took care of the structure of text flow in terms of *sthāna-adhyāya - adhikarana - śloka* followed by the *tīkā/vyākhya* (commentary or commentaries.) After ensuring the completion of these two steps the work was advanced to the steps of user interface. The details of which are as follows:

Software architecture and technology:

Keeping in view of the wide spread presence of browser based technology, it was agreed up on to build an application which is Server and browser client based, which can also be deployed using any portable 'or' local server on any computer barring different Operating System (OS) platforms. To achieve this a robust and very successful server side scripting language PHP was utilize to write the logic, and for all the front end standard HTML was employed to serve the client requirements. The advantages of using PHP were, it was freely available, deployable on Apache server, open source free software and was deployable on Windows, Apple and Linux machines with ease. Choosing this also gave the developers an opportunity to deploy the application on a portable server 'Server2go' and create an installable version for Windows version which is widely used in a country like India. Apart from this for providing vernacular language support in 8 languages (*Bengali, Dēvanāgari, Gujarathi, Gurmukhi, Kannada, Malayalam, Tamil, Telugu*), ISO 15919 (IAST) encoding, and phonetic English reading support an 'javascript' based Mozilla-Firefox-add-on 'Padma' was configured. The ultimate result of this selection and effort is production of a strikingly light weight, cross platform application.

Details of e-Book design based on user requirements:

Requirement	Items	Ayurveda E-Book features
Navigation design	Orientation clues	Author and the commentator's names along with

		saṁhita name are prominently displayed on title bar to provide clear identification.
	Cross-referencing between table of contents and chapters Navigation aids	Links from *Sthāna* (part) to *Adhyāya* (Chapter) and Chapter to *Adhikarana* (Context) are clearly provided as drop down lists. Apart from this the pāṭhabhēda (variant text) is provide as end note with a hyperlink (REFLINK).
Page layout	Table of contents (TOC)	Separate TOC is not provided as the navigation section handles this requirement.
	Amount of information, arrangement of media.	Information is arranged in the central part of browser page to facilitate full view of the displayed contents.
Content design	Chapter headings	Chapter headings are conspicuously placed.
	Body text	Body text is colored and given in different sizes to distinguish between 'Main content of the text', supported commentaries,and *pāṭhabhēda*-variant text.
	Emphasized text	Alphabets are transliteratable, UTF 8 encoded. Enough weight is given to provide clear visibility on different browsers.
	Contrast between text and background	Background color is in clear contrast with the text, reduces glare and helps better readability.
	Page length contents presentation	Depends on the Adhikarana size. Adjustable as all the browsers provide up and down; right left navigation.
	Text alignment	In general left aligned.
	Line spacing	Conveniently spaced to avoid overlap.

Salient feature of Ayurveda E-Books:

a. Platform independent

The salient feature of eBooks of NIIMH are the technology they come with which is Platform independent i.e. can be used on a Windows/ Linux/ Unix machine and also can be hosted on the Web. They are portable and come with key word search option using phonetic English which provides the results in KWIC- Key word in the context. The advantage of KWIC type of result is that it can be directly cited by the user for their work which provides the sthāna- number and also the śloka number.

b. Multilingual transcription

It is a well known fact that the lingua franca of Ayurveda is Sanskrit and the generally accepted script is Dēvanāgari. It is also a well known fact that many Ayurveda Colleges in India till few years back were carrying out teaching in vernacular languages. Many classical Ayurveda Books are available in vernacular scripts specially in *Telugu, Malayalam, Kannada* etc., Though it is recommended to read *Ayurveda* classical texts in Dēvanāgari, to gain access to those who are not comfortable to use *Dēvanāgari* Script, the eBooks are prepared in such a way that one can read them in 8 Indian scripts namely B*engali, Dēvanāgari, Gujarathi, Gurmukhi, Kannada, Malayalam, Tamil, Telugu,* Indo-Romanic transliteration (IAST- Diacritical) and Phonetic English through transliteration option. They are all offered in Unicode-UTF8, which is completely non-proprietary and available throughout the world.

c. Key word in the context (KWIC) search

Research papers, reports, notes based on Ayurveda cite quotations from the texts very frequently. The references are often context based and need to be specifically quoted as per the location of the content in terms of *sthāna- adhyāya - adhikaraṇa - śloka*. An example for this is definition of svastha-the healthy is as follows: a person having balanced *dōṣas*-bodily humours, *agni*-proper metabolism, *dhātu*-tissues, mala-proper excretion, *prasannātma, indriya* and *manas*-pleasant disposition and well functioning sense organs (su. sū. 15 / 41). This is the translation of 41st *ślōka* (poem) mentioned in *Suśrutasaṃhita, Sūtrasthāna* 15th chapter which is abbreviated as su. sū.15/41. So an E-book on AYURVEDasaṃhitas has to take this requirement into consideration.

A search option is provided in E-books which enables the reader to type the key word in phonetic English which will be searched throughout the text and results are displayed as per the *sthāna- adhyāya - adhikaraṇa - śloka* as explained above. This is a very important requirements addressed in this module which caters the specific need of *Ayurveda* readers. The results are displayed in the ascending order of sthāna- adhyāya - adhikaraṇa for easy navigation and selection. All the key work in the context displayed are hyperlinked to the original context and on selecting the same the actual page will be displayed with the word searched for highlighted prominently. Once the reader is satisfied with the selection the text can be copied to notepad or any word processor application for further usage.

The work reported here is in very nascent stages, and lot more has to be done to bring in as many *Ayurveda* texts as possible in E-book format. The ultimate aim would be to have a centralized repository of original *Ayurveda* electronic texts with multiple search and data mining options. The readers of this article are requested to go through the software

applications released so far and provide the institute with their valuable suggestions to improve up on the work.

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सारांश

राजनिघण्टु के लेखक नरहरि की जीवनी

पी.वी.वी. प्रसाद एवं अला नारायण

काश्मीर के निवासी नरहरि पण्डित ईश्वरसूरी के पुत्र थे। वह संस्कृत ज्ञान की सभी शाखाओं के पण्डित थे। वह कर्नाटक, महाराष्ट्र और आन्ध्रप्रदेश की क्षेत्रीय भाषाओं में निष्णात थे। उनकी कृति को राजनिघण्टु एवं अभिधान चिन्तामणि के नाम से भी जाना जाता है। इनका काल शाङ्गमिश्र के पश्चात् १७ वीं शताब्दी में निर्धारित किया गया है। इस ग्रन्थ में कतिपय नवीन और अधिक रोचक पादप जैसे ब्रह्मदन्ती, धूम्रपत्र, एकवीर, हास्तिशुण्डी, जम्बु, झण्डु, समुद्रफल, श्वेताम्ली, श्वेता, वृश्चिका आदि को सम्मिलित किया गया है। अतः इस लेख में नरहरि और उनके कार्य को प्रस्तुत किया गया है।

सारांश

गुरुकुलयुग से इलेक्ट्रॉनिक युग तक आयुर्वेदिक शिक्षण में परिवर्तन

अला नारायण एवं साकेतराम त्रिगुल्ला

अतीत काल से आयुर्वेद अपनी योग्यता के कारण, एवं साहित्यिक धन के बलबूते पर आज भी जीवित है। दो सदियों के पूर्व भी भारतीय विज्ञान का अध्ययन, अध्यापन मौखिक था, तत्पश्चात् अनेक आयुर्वेद–ग्रंथों की पाण्डुलिपियाँ तैय्यार की गयी जो भावी पीढ़ी तक आयुर्वेद वाङ्मय को सुरक्षित रखने के लिए उपयुक्त थी। मुद्रण प्रौद्योगिकी के आगमन और राष्ट्रीय अस्मिता को पुनर्जीवित करने वाली विचारधारा के कारण, कुछ महत्त्वपूर्ण आयुर्वेद ग्रंथों को १९वीं सदी के प्रारम्भ में प्रकाशित किया गया। तत्पश्चात् धीरे–धीरे सर्वाधिक लोकप्रिय आयुर्वेद पुस्तकें मुद्रित पुस्तकों के रूप में प्रकाशित हुई। आज दुनिया भर में सूचना प्रौद्योगिकी के व्यापक प्रसार के उपयोग के कारण प्रकाशित साहित्य की सुरक्षा करने के लिए मुद्रित पुस्तकों का डिजिटिकरण बड़े पैमाने पर हो रहा है। प्रायः ये पीडीएफ के रूप में या चित्र के रूप में मिलते हैं, जिनमें शब्द का उपयोग करते हुए खोजना, भारतीय भाषाओं में उपलब्ध पुस्तकों में बहुत कठिन है। इस समस्या का समाधान इलेक्ट्रॉनिक पुस्तकें (ई–बुक्स) हैं, जो कम्प्यूटर के माध्यम से पठनीय है। इनमें व्यापक रूप में शब्द का उपयोग करते हुए खोजना, आसानी और दक्षता के साथ अतिरिक्त सामग्री का सञ्चयन करना इत्यादि बहुत आसानी से किया जाता है। इलेक्ट्रॉनिक रूप में आयुर्वेद–ग्रंथों की कमी को ध्यान में रखते हुए राष्ट्रीय भारतीय आयुर्विज्ञान अनुसन्धान संस्थान ने उच्च गुणवत्ता वाली ई–पुस्तकों के उत्पादन में विशेषज्ञता विकसित की है। विभिन्न चरणों में, आयुर्वेद के अतीत से लेकर आज तक आयुर्वेदिक शिक्षण, अध्ययन सामग्री में लगातार आये परिवर्तनों की चर्चा यहाँ प्रस्तुत की गई है।