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TRADITIONAL AND MODERN SCIENCES TECHNOLOGIES IN INDIA

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ABSTRACT

The Indian subcontinent encompasses a diverse array of knowledge systems and practices, which coexist in a fascinating range today. In this presentation, the following key points will be covered.
The Traditional Indian Knowledge Systems are defined by a distinct nature and set of characteristics, which can be summarised as folloSpecific illustrations from various sectors of Science and Technology.
These traditional knowledge systems exhibit distinct characteristics that set them apart from their counterparts.
Consider the potential for connections and collaboration between these different traditions both in the present and in potential future scenSpell out some specific ways in which these traditional knowledge systems differ from their modern counterparts. Reflect on the possibilities of inter-linkages and cooperation between these varying traditions as they occur today as well as in terms of future possibilities.
Contemporary scholarships in science, focusing on disciplines such as Sociology, Epistemology, or Historiography, generally rely on the premise that modern Western science serves as the paradigm for a "Scientific Knowledge System". Accepting this criterion would likely render it improbable to find scientific knowledge in any other tradition since we have not identified knowledge systems that are identical to the modern Western knowledge system elsewhere. To overcome this constraint, we must first develop an unbiased standard for designating a knowledge system as "scientific". We will first focus on a particular branch of the traditional Indian Knowledge System and evaluate it according to criteria that are generally accepted, in order to determine how it stacks up as a scientific pursuit.
We'll focus on the specific characteristics of traditional knowledge systems that distinguish them from modern systems of knowledge.
The social organisation of knowledge is a fascinating aspect. Knowledge in India prevails and is expressed at varied levels in diverse areas. In many areas such as medicine, arithmetic, agriculture, grammar, language, dance, music and astrology, to name just a few there is wide and extensive knowledge both at the level of classical texts and folk traditions. They are commonly referred to as: “Shastra” and “Lok Parampara” respectively. There is every reason to believe that on the ground today folk traditions are widespread in various walks of life and vibrant.
Research on traditional knowledge by scientists from the mainstream science and technology institutions is not a new phenomenon. However a lot of this research suffers from the limitations of a mindset which essentially looks upon physical resources as well as technologies and knowledge of traditional societies as “raw material” that needs to be prospected so that one may extract what is worthwhile and useful to incorporate it into a modern western framework. This is a hangover of a colonial past and today there is an increasing perception that such activities do not lead to revitalisation of traditional knowledge or wholesome development of the communities involved.
However, in recent times there have been instances of healthy collaboration between various knowledge systems and we shall spell out some examples and possibilities of how different system scan workhand in hand to meet specific requirement or social goals.

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1. INTRODUCTION

1.1. RECOGNISING “SCIENTIFIC KNOWLEDGE”

All present-day scholarships on science from various points such as Sociology, Epistemology or

Historiography are mostly based on the assumption that western sciences in its modern phase is THE paradigm for a – "Scientific Knowledge System". If we were to accept this criterion it is unlikely that we shall discover scientific knowledge in any other tradition since we do not find any knowledge systems identical with the modern western knowledge system anywhere. To free ourselves from this limitation we must first evolve an unbiased criterion for calling a knowledge system – "Scientific".. One can simply turn back to the school-text definition of 'science'. 'Science' is the body of knowledge based on observation of phenomena and their classification under a theoretical framework, which itself is tested in observation'. Thus, all that one has to look for is a knowledge system that has the following characteristics – methodological, epistemological and sociological.

2. METHODOLOGICAL CRITERIA

- M1 It is based on a sufficiently large body of observational data.
- M 2 It has a sufficiently elaborate theoretical framework to classify the data.
- M3 The basis of legitimisation of theoretical speculation is based in observation

The above methodology obviously presupposes the epistemological position that:

3. EPISTEMOLOGICAL CRITERIA

E1 The above method is a legitimate method for acquiring knowledge about reality.

E2 The knowledge so acquired is always limited and subject to modification considering new

data. Since the above epistemological – methodological criteria make knowledge an accretion process –ever increasing and changing through the addition and assimilation of new data – acquisition of such knowledge can only be a collective activity. Therefore, in order to show that in a society a knowledge system based on the above criteria actually flourished, we must also show the presence of a community of practitioners. Thus to the above list of methodological – epistemological criteria, we must add the sociological criterion that :

4. SOCIOLOGICAL CRITERION

S1 In the society there is a professional community of practitioners of knowledge in the above

sense, well governed by some social norms.

If in a knowledge system of an ancient civilisation we can find all the above characteristics, he can have no hesitation in calling such a knowledge system 'scientific' – whether that system fits in with the 'modern science' paradigm or not. The current tradition of scholarship on science-obsessed as it is with the 'modern science' being the only 'scientific' knowledge system that mankind has produced– may not agree with it, but for any unbiased observer such a knowledge system must have all claims to be called 'scientific'.

Let's now use the Traditional System of Medicine in India as a case study to examine its alignment with the previously outlined criteria in more depth.

The empirical basis begins with M1.

5. THE AYURVEDIC TEXTS PLACE A HIGH VALUE ON EMPIRICAL OBSERVATION.

Provide a comprehensive outline detailing the methodical process for collecting data on pharmaceuticals, identifying and recording pathological symptoms, and conducting thorough anatomical studies through the meticulous dissection of deceased human bodies, with an emphasis on adhering to established scientific protocols and maintaining meticulous record-keeping throughout the process. The amount of data collected on all these factors is truly impressive. According to the Charaka Samhitha, it discusses a total of one hundred and sixty-five varieties of animals in relation to drugs of animal origin.

The various animal products utilised in medical contexts are listed, stating "honey, milk, bile, fat, marrow, blood, flesh, excrement, urine, skin, semen, bones, sinews, horns, nails, hooves, hair, and coracana – these are the substances derived from animals used in medicine". And the data accumulated on all these aspects is stupendous.

gorocana – these are the substances used in medicine from the animal world". Again, Charaka-Samhitha mentions 64 main minerals used for drugs. If we add to these – 600 to 700 drug plants with theirdifferent parts forming different drugs, 165 varieties of animals again with different products and parts acting as different drugs, and 64 main minerals – the various pharmacological preparations to which each of these drugs could be subjected, then one can have some idea of the enormity of the pharmacopoeia on which Ayurvedic medicine was based. In fact, the *Charaka-Samhitha* itself speaks of "six hundred purgatives and five hundred decoctions", besides the eighty four varieties of wines…" The respect for empirical observation of the Ayurvedic physicians is so great the *Charaka-Samhitha* states"The entire world is the teacher of the intelligent physician, as it is the foe of the fool". Furthermore, both *Charaka* and *Susruta Samhithas* declare, "No substance is found in the world which is without relevance for medicine."

6. DEVELOPMENT OF M2 THEORETICAL FRAMEWORK FOR CLASSIFYING EMPIRICAL DATA

Ayurvedic physicians recognise the necessity of a theoretical framework to interpret empirical data, thereby transcending empirical limitations. They believe that in addition to their understanding of substances, something more is necessary for their intended use. They assert that rational application is the fundamental basis of ultimate therapeutic success. A doctor who skilfully applies reasoning is consistently more effective than one who relies solely on empirical knowledge of the substances. Or as *Charaka* states"… No one can claim to have a perfect knowledge of pharmacology by the mere acquaintance with the names or even forms of herbs. If one who knows the uses and action of herbs, though not acquainted with their forms, may be called a pharmacologist, what then need be said of the physician who knows the herbs botanically, pharmacologically and in every other respect?…". In accordance with their expressed preference for a medicine based on theoretical formulation the Ayurvedic physicians develop an elaborate theoretical framework to classify and understand data on drugs and diseases and to infer the ways of curing diseases. This is not the place to go into the details of the theoretical framework of Ayurveda. Suffice it to say that the framework established was elaborate enough to classify and understand the huge amount of data ondrugs, diseases, diet, soil conditions etc., that the physicians collected.

states "A learned physician must never try to examine on grounds of pure logic the efficacy of a medicine, which is known by direct observation as having by nature a specific medical action. Thus, for example, even a thousand logical grounds will not make the *Ambastha* group of drugs have a purgative function". We can similarly go on to describe the results of our assessment based on the epistemological and sociological criteria. However we do not wish to enter into the details of discussion here, except to state that indeed by these criteria also Traditional Medicine stands the test of being a "Science".

7. DIALOGUE BETWEEN SCIENTIFIC TRADITIONS : CURRENT LIMITATIONS

The current status of interaction between the two scientific traditions in India – traditional and modern suffers from several limitations. In a broad sense some of these are the result of the colonial hangover. Here we would just like to look at two aspects of this interaction namely the limitation of the overall approach to studying traditional knowledge in the form of – "prospecting" traditional knowledge and the assumed universality and neutrality of the methodology of modern science.

8. TRADITIONAL KNOWLEDGE ASSOCIATED WITH PROSPECTING.

Researchers from prominent Western scientific and technological establishments have been investigating traditional knowledge for a considerable period. This research is often limited by a narrow viewpoint, viewing physical resources, local community technologies, and knowledge as raw materials that need to be assessed, investigated, and refined before they can be incorporated into modern Western practices. Over several centuries, a large number of herbs have been tested for their pharmacological properties, with several notable successes emerging, one of which was the isolation of quinine from the Cinchona bark. It is often thought that these studies often fall short in helping to revive traditional knowledge and promote growth from within the affected communities. Consider the hypothetical situation of.

This small shrub used to be widely distributed throughout India, reputed for its medical potential in treating hypertension, fever, wounds, insomnia, epilepsy and certain conditions of karma and Vatha (Ayurvedic categories)

disorders. At the beginning of the 20th century modern research was carried out on this plant, and the 'crude drug' was fractionated into 'active ingredients'. One of these ingredients, the alkaloid Reserpene, was identified as a powerful drug for hypertension. Subsequently, the drug based on Reserpene had several undesirable side effects, which were not present in the original formulation of Rauvolfia serpentina used in traditional medicine. Meanwhile, the research and use of the plant did not lead to strengthening of the traditional knowledge of the subject, while the industrial demand resulted in over-exploitation of the plant in the wild

9. THE UNIVERSALITY AND OBJECTIVITY OF MODERN SCIENTIFIC METHODOLOGY.

A further complicating factor in the interaction between the two traditions has been the unclear depiction of the methodology employed in modern science. The standard approach used in contemporary science is considered to be global in scope, applicable to every culture and scientific field, and unbiased, allowing it to judge the legitimacy of any scientific discipline. A closer look at the components of modern scientific methodology reveals that they often bear the mark of their origins, and underlying this methodology may be presuppositions and assumptions unique to the modern scientific tradition. Let us take for example the modern scientific method of drug assessment by employing blind trials, double blind trials and placebos.

10. DEVELOPING A NEW FRAMEWORK FOR COLLABORATIVE PARTNERSHIPS BETWEEN

In the preceding sections, an overview of the Indian scientific tradition's characteristics has been provided, its unique aspects explained, and the differences between it and modern Western scientific tradition outlined, along with a summary of the limitations of their past interactions.

In conclusion, I would like to highlight two key elements that have significant potential for shaping a new collaborative framework in the years to come. Recent initiatives have aimed to foster collaborative efforts and harness creativity found at the grassroots level, particularly in relation to preserving traditional knowledge. They are – some recent attempts to build healthy collaboration as well as the creativity exhibited at the grass roots level in terms of traditional knowledge.

11. HEALTHY COLLABORATION AND CO EVOLUTION

In varied areas of traditional knowledge systems there are instances of healthy collaborations with modern knowledge. If we take the case of healthcare systems we see this occurring between

Ayurveda, Yoga, Siddha and modern medicine and to a limited extent also with Homoeopathy. Some kinds of partnerships that have sprung up between these traditions in recent times can be illustrated below.

In some cases, modern medicine is used as a main line of treatment with traditional systemoffering supplementation and long term care. For example, in the case of heart patients those with acute problems of great severity may indeed go in for surgery but during the recovery period their treatment is supplemented with the use of Ayurvedic drugs, Yoga exercises and counselling regarding life style based on traditional medicine which can help remarkably in their recovery and even taper off and limit the use of drugs.

In some cases traditional medicine may offer the main line of treatment with modern medicine playing a complementary role. For example, in the case of asthma, a patient can be kept fit based only on Yoga exercise and dietary restrictions. However, in rare instances where there is an acute and sudden attack (due to stress, change of place or allergens etc.) the modern medicine may step in for emergency care.

12. FOLK TRADITIONS TODAY : CREATIVITY AT THE GRASS ROOTS

It is likely that folk traditions are widespread and thriving in all areas of everyday life. Every sign suggests that they are showing dynamism and ongoing development. For instance, consider the resource base of traditional medicine as an example. The Government of India's Department of Environment launched the "All India Co-ordinated Research Project on Ethno Biology" in the 1980s, with the goal of conducting a comprehensive evaluation of the knowledge and utilisation of Natural Resources by tribal communities across India. A report published in 1994 on this programme found that the

communities know approximately 9,500 plant species, with medicinal plants being the most significant category, accounting for over 7,500 species.

Looking back, it is evident that over time, every part of the world has developed and produced sciences and technologies that are uniquely representative of its own culture and society. Over the past few hundred years, and especially in the last hundred or so years, a common misconception has emerged that the western tradition of science and technology is singular and applies universally. This perspective has not only been promoted by the majority of scientists in the Western world but has also been embraced by professionals in many other regions, especially in developing countries. In the West, there exists a body of academic work highlighting various traditions of science and technology. Nonetheless, such literature and debates are predominantly reserved for theorists and specialists operating at the forefront of philosophical or scientific epistemology.

CONFLICT OF INTERESTS

None.

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