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Review Article

Conceptual parallels between *Paramanu vada* and Dalton's Atomic Theory: A Cross-Disciplinary Review

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Abstract

Science is a systematic pursuit of knowledge that involves the study of natural phenomena and their practical application. It encompasses diverse disciplines, each contributing to a deeper understanding of the physical world. Chemistry is one such branch of science concerned with the composition, structure, properties, and transformations of matter and is often regarded as the science of atoms and molecules. Dalton's Atomic Theory, proposed in -A New System of Chemical Philosophy, marked a paradigm shift in understanding the composition of matter. Meanwhile, ancient Indian science is a rich repository of scientific concepts, many of which continue to hold relevance in the modern era. Among these, Ayurveda and *Vaisheshika Darshana* explain the atomic nature of matter through *Karya-Karana Siddhanta*, which encompasses *Paramanu Vada*. The present study aims to explore the conceptual parallels between *Paramanu Vada* and Dalton's Atomic Theory, with special emphasis on the role of *Vayu*, *Karma*, and *Swabhava* in the reorganization of atoms in biological systems. A comprehensive literary review was carried out using classical Ayurvedic texts, *Padartha Vijnana* textbooks, NCERT chemistry textbooks, and relevant published literature. The analysis revealed notable similarities between the concepts of Ayurveda and *Vaisheshika Darshana* and Dalton's Atomic Theory while also highlighting the unique biological perspective of Ayurveda regarding atomic interactions. This study attempts to bridge ancient Indian scientific thought with modern atomic theory, emphasizing the relevance of *Paramanu Vada* in understanding the nature of matter.

Keywords- *Paramanu Vada,* Atom, Dalton's atomic theory, *Karya-Karana Siddhantha.*

1. Introduction

Ayurvedic *Samhitha's* are scientific and systematic treasure trove of knowledge. These *Samhitha* were composed by *Aptha's*[1] after repeated research hence their teachings remain universally relevant and applicable across all ages. Ayurveda also acknowledges the interconnectedness of various concepts across different branches of knowledge, including *Darshana Shastra.* This highlights the presence of similar ideas and principles across multiple disciplines. The *Karya-Karana siddhantha*[2] includes *Paramanu Vada*[3], that serves as a fundamental framework for understanding the mysteries of matter formation and the origin of universe by examining the intricate relationship between *Karana* (Cause) and *Karya* (Effect). Similarly, in the realm of modern science, Dalton's Atomic Theory was one amongst the earlier theories for unravelling the concepts of matter further offering a foundational framework for comprehending its structure and properties. A closer examination reveals intriguing parallels between Ayurveda and Chemistry. The importance of ancient science is being progressively recognized globally, as evidenced by the NCERT chemistry textbook's[4] inclusion of references from classical ancient texts, acknowledging the valuable contributions of India's rich scientific heritage. By considering all the above facts, this literary research undertakes a comparative analysis of the fundamental postulates of Ayurveda and chemistry. The review aims to understand and critically analyse Dalton's atomic theory in relation to *Paramanu Vada,* with particular emphasis on the rationale underlying the *Samyoga* (combination) and *Viyoga* (separation) of *Paramanu* in *Chetana Dravya.*

2. Concept of Dalton atomic theory

John Dalton was a renowned English Chemist, Physicist and Meteorologist. In the field of Chemistry, Atomic theory was his famous contribution. In 1808, Dalton published 'A new system of chemical philosophy' in this he proposed the following theories to understand the structural composition and properties of matter.

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2.1 Daltons atomic theory[5]:

Matter is made up of small indivisible particles called atoms.

All atoms of a given element have identical properties, including identical mass. Atoms of different element differ in mass.

Compounds are formed when atoms of different elements combine in a fixed ratio (Simple whole number).

Chemical reactions involve reorganisation of atoms. These are neither created nor destroyed in a chemical reaction.

Dalton's atomic theory was able to explain the following Laws:

Law of conservation of mass : Atoms can neither be created nor destroyed and in all the physical and chemical changes there is no net change in the mass after process.

Law of definite composition/proposition : A given compound always contains exactly the same proportion of element E.g. Both Natural and Synthetic sample of Cupric carbonate has same proportion of carbon, copper and oxygen.

Law of multiple proportion : When two element form more than one compound, the different masses of one element that combine with the fixed mass of other element are in ratio of small whole number.

Limitation of Dalton's atomic theory :

It fails to explain the subatomic particles (Proton, Electron and Neutron).

It couldn't explain isotopes, isobars and allotropes.

Combination of elements in compound need not always be a simple whole number.

2.2 Paramanu vada

The ancient Indian school of *Vaisheshika Darshana* introduced the concept of *Paramanu Vada*[6], it is also accepted in Ayurvedic science. The process of continuous division of any substance (*Dravya*) ultimately yields an irreducible, minute entity known as *'Paramanu'*, beyond which further division is not possible. According to *Visheshika Darshana* : *Prithvi, Ap, Teja* and *Vayu* are in *Paramanu* form. *Acharya Charaka* explains properties of *Paramanu* in *Shareera sthana*[7] *as Atibahutvat* (Innumerability)*, Atisaukshmyat* (Minute)*, Atindriyatvat* (Not perceivable). According to Acharya Charaka[8] the reason for *Samyoga* and *Viyoga* of *Paramanu* are *Vayu, Karma* and *Swabhava. Sharngadhara* explains *Paramanu* as the 1/30th part of the smallest visible particle that is observed at the time of sun rays passing through the window[9]. According to *Shabdakalpadruma* properties of *Param-anu* are *Nitya* (Eternal), *Niravayava / Ekav - ayavee/Antyavayava* (indivisible),*Sukshma /Achakshushya* (Subtle /Invisible).

स च नित्यः निरवयवः ततः किमपिसूक्ष्मं नास्ति । (शब्दकल्पद्रुम)

Samyoga and *Viyoga* within *Paramanu is explained as* two *Paramanu* combine to form *Dwayanuka,* three *Dwayanuka* or 6 *Paramanu* form *Trayanuka,* four *Trayanuka* or 24 *Paramanu* form *Chaturanuka* and so on This concept clarifies the formation of *Sthula Dravya* from *Paramanu. Dravyas* from *Dwayanuka* onwards are called *Karya Dravya.*

Recent scholarly work by Mahato[10] (2024) provides a critical analysis where *Vaisheshika* atomism is contrasted with modern atomic theory, evaluating their fundamental similarities, structural differences, and broader philosophical implications. This research highlights that while both systems agree on the indivisibility of the smallest particle, they diverge in their philosophical approach—modern theory focuses on quantitative mass, whereas *Vaisheshika* incorporates qualitative and metaphysical factors like *Karma* and *Adrushta* into the behaviour of matter.

3. Discussion

Science is a systematic pursuit of knowledge aimed at understanding the world and solving problems to enhance human living. The approach to understanding science evolves over time, influenced by the time, intellectual, place and educational systems. To bridge the gap between ancient and modern scientific thought, integrating ancient concepts with contemporary ideas can be particularly effective. This article adopts such an approach, exploring the ancient Indian concept of *Parmanu Vada* in parallel with Dalton's atomic theory. By comparing these two perspectives, it can give a deeper understanding of the historical development of scientific ideas and their continued relevance in current times. This comparative analysis will provide insights into the similarities and differences between ancient and modern atomic theories.

Parallel understanding of Dalton's atomic theory and *Paramanu vada.* Dalton's postulate states that matter comprises indivisible atoms. Interestingly, this concept bears a striking resemblance to the *Paramanu vada*, which describes *Paramanu* as indivisible (*Niravayava/ Ekavayavee/ Antyavayava*). Similarly, atoms are considered the fundamental building blocks of matter, indivisible in nature. This parallelly highlights a strong connection between Dalton's atomic theory and the *Paramanu Vaada*. Eg: A wooden piece after continuous division reaches the indivisible form called *Paramanu*.

Here arrives a limitation to this postulate stating the presence of sub atomic particles called Protons, Electrons and Neutrons But, in case of *Paramanu vada, Paramanu* itself is the smallest particle that is further indivisible in form but it is of 4 different kinds namely: - *Prithvi Paramanu, Jala Paramanu, Agni Paramanu* and *Vayu Paramanu*. These *Paramanu* combine in specific ratios to form specific *Dravya*.

Dalton's postulate asserts that all atoms of a given element have identical properties, including identical mass. Atoms of different element differ in mass. Similarly, in *Paramanu Vaada*, *Paramanu* combine in specific ratio to form *Dravya.* Identical *Paramanu(4 Paramanus indivisually)* in a given *Dravya* possess identical mass and property. For E.G, *Prithvi Paramanu* is of identical nature in *Nimba* alongside it possesses identical mass whereas the nature and mass of *Prithvi Paramanu* in *Ashwagandha* is different from that of *Nimba*. These *Paramanu* of each *Dravya* (substance) combines in unique ratio during union and this differentiate them from the *Paramanu* of other *Dravyas*. Furthermore, just as the *Karya Dravyas* (derived substances) are numerous, the ratio in which *Paramanu* constitute them are also infinite in number.

Here again arrives a limitation to this postulate stating that Dalton's theory couldn't explain Isotopes, Isobars and Allotropes.

Isotopes[11] are the variants of an element with same number of Protons and different number of Neutrons that means it has same atomic number but different atomic mass. This variation is due change in the count of neutron. Here as there is no change in the count of Protons or



Here, MS - Mass number= Proton + Neutrons
AT - Atomic number= Protons

electrons element doesn't change.

This can be analysed through Paramanu vada as follows:

All *Karya Dravya* are *Panchamahabhautika* namely *Prithvi, Jala, Agni, Vayu and Akasha*. *Prithvi* adds the mass to *Dravya*, *Jala* plays a role of binding, *Agni* is energy component, *Vayu* is responsible for all kinds of movement and *Akasha* component contributes to the empty space in *Dravya*.

In isotopes there is variation in the *Prithvi Mahabhuta* leading to variation in mass and that variation occurred is compensated in *Akasha Mahabhuta* as *Akasha* is having property that provides space, the variation of mass in *Prithvi Mahabhuta* is compensated without altering the ratio of other *Mahabhuta.* Hence mass changes without the change in *Dravya*.

Chart-1 and Chart-2 represents isotopes, here the variation in percentage of Prithvi represents mass change and it is compensated in *Akasha mahabhuta* hence there is variation in mass without change in *Dravya*.

Isobar[12] are the elements with same atomic mass with different atomic number Chart-3 and Chart-4 represents Isobars, here *Prithvi* component is kept constant hence there is no variation in mass whereas the ratio amongst rest four *Mahabhutas* may be changed hence the *Dravya* also changes keeping the mass constant.

Allotropes are defined as different structural forms of the same element that exhibit distinct physical properties, such as the contrast between Diamond and Graphite. Dalton's theory could not explain allotropy, but *Paramanu Vada* this could be understood that the *Karana Paramanu* remains the same whereas the *Karya Dravya* changes based on their *Samyoga*. For example, the hardness of diamond versus the softness of graphite is a result of the specific spatial configuration guided by *Vayu* and the varying influence of *Prithvi, Akasha* etc *Panchamahabhuta* within the same atomic base.

Daltons next postulate states that Compounds are formed when atoms of different elements combine in a fixed ratio (simple whole number) and the limitation to this postulate is combination of elements in compound need not always be a simple whole number. According to *Paramanu Vada* of Ayurveda the ratio and number of *Paramanu* is not fixed and it will vary according to nature of individual *Dravya.* Chemical reactions involve reorganisation of atoms. These are neither created nor destroyed in a chemical reaction. This can be substantiated that as the *Paramanu* are *Nitya*, the *Vikara* (changes) of *Paramanu* will not occur during *Samyoga* and *Viyoga* (Chemical reaction). Acharya Charaka in *Shareera sthana* has stated three reasons for *Samyoga and Viyoga of Paramanu in Chetana Dravaya* these are the sole cause for rebirth; *this* can be considered as a special contribution of Ayurveda from that of atomic theory:

Vayu- Shareera occurs by *Samyoga* and *Viyoga* of *Paramanu* guided by *Chalaguna* of *Vayu* as it brings *Paramanu* near for *Samyoga* and *Viyoga*, because all components of *Shareera* are *Pangu* and *Chalatva* in that component occurs only by *Vayu*[8].

Karma- For the rebirth of any individual it solely depends upon the *Karma* and *Karmaphala* carried by *Atma* along with four *Mahabhuta* and it will further decide the type of species in which the birth occurs[8].

Swabhava- Swabhava is the inherent tendency of an entity to behave in certain way. *Samyoga* and *Viyoga* of *Paramanu* naturally occurs by *Swabhava*[8]. E.g. It is natural that homogenous substances unites and heterogeneous substances separates as seen in human body different cells unite and separates on the basis of homogenous and heterogenous nature with some inherent tendency within as like only osteocytes can unite to form bones and myocytes unite to form muscle by *Swabhava* these are bought together by *Vayu* and union is because of *karma*.

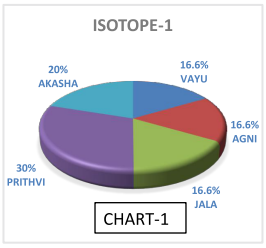
The application of *Karya Karana Siddhantha* in *Samyoga* and *Viyoga* of *Paramanu* can be understood as *Karya Niyata Purva Vrutti* is *Karana*. This means for manifestation of each *Karya* there is a definite and specified *Karana* available in the form of *Samavayi, Asamavayi*, and *Nimitta Karana*. In this context for the *Karya* that is *Samyoga* and *Viyoga* of *Paramanu(Karya)* there is *Karana* as follows: *Purva Janma Krutha Karma* and *Swabhava* of *Paramanu* acting as *Samavayi karana*, *Samyoga* of *Purva Janma Kruta Karma* and *Swabhava Yuktha Paramanu* act as a *Asamavayi Karana* and as *Vayu* brings these *Paramanu* together for *Samyoga* and *Viyoga, Vayu* act as a *Nimitta Karana.*

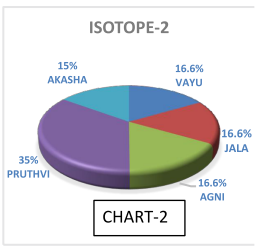
Conclusion

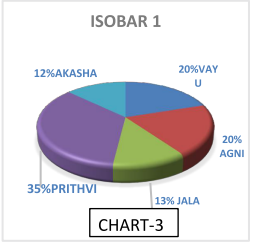
Interdisciplinary researches are need of the hour to uncover more insights from ancient Indian science for further understanding of the world as like The Dalton's atomic theory had been closely analysed with concepts of *Paramanu vada.* Rich ancient Indian science is gradually been forgotten and unexplored leading to loss of many concepts without knowledge so it is the time to hunt into ancient science in joined hands with various disciplines of modern science.

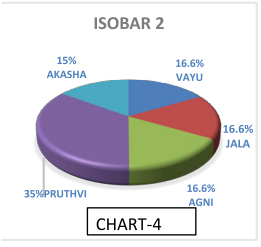
This comparative analysis is primarily constrained by its focus on the classical atomic frameworks of Dalton's Theory and *Paramanu Vada*. Today, the precise, mathematically-driven theories of Quantum Physics and cosmological concepts like Dark Matter dominate the study of matter. However, the concepts within *Paramanu Vada* remain remarkably specific and time-tested, and can be applicable even to these present concepts. Future studies are thus needed to deeply explore and correlate the enduring principles of *Paramanu Vada* with these advanced, experimentally validated theories of contemporary physics.

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