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Origin of Laws of Motion (Newton's Law): An Introspective Study

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ABSTRACT: *The name 'Sir Isaac Newton' is so famous that everybody in this world is aware of it. He is famous for his 'laws of motion' and also 'law of gravity'. These laws form the basis of classical Physics. But very few people may not know that the same idea was given by an Indian (Rishi Kanada) long before the era of Newton. The Indian ancient civilization has given birth of many theories of today's science and technology, but the origin of these theories remained folded and hidden due to several reasons. What world is thinking today, ancient Indians did it in the Vedic period? This study is a descriptive type of research based on secondary data gathered from books, articles, websites and web-based journals. The objective of the study is to search the actual origin of laws of motion.*

KEYWORDS: *Laws of motion, Law of gravity, Classical Physics, Vedic period*

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I. INTRODUCTION

Every civilization, which has brought development economically and socially, has attributed its success to science and technology. India is proud to have one of the oldest civilizations in the world with one sixth of world population and one third of scientific and technological manpower. The pre-history of India began with the vast Indus Valley civilization, which represented a cultural continuum. The excavations, which were done at Harappa and Mohenja-daro (now in Pakistan) in 1930's by John Marshall of England, shows the age of India's oldest civilization as more than 2000 B.C. It is interesting to note that at this dawn of India's history, she did not appear as an infant, but already grew up in many ways. The Indus Valley people created things not only of beauty but also of utilitarian and more typical emblems of modern civilizations. The high point of this civilization was the mature urban Harappan phase (2500-2000 B.C.A) characterized by well-planned cities, extensive external trade, manufacture of artistic seals, development of Harappan script, etc. [2]

Phase of Vedic period

Vedic period precedes a new dimension to the issue of today's modern life. It is referred to know more about Vedic and Puranic Science. The cultural, religious, social, literary, and political life of the people of Vedic period is well documented in four Vedas: Rig, Yajur, Sama and Atharvana. The rishis or saints have tried to answer many of the mysteries of the world through their intuition and experience. Rig Veda is the oldest book whose main contents were composed in 4500 B.C.A. It was a compilation of 1028 hymns composed by a large number of authors over many generations. [4]

India could not have continued a cultured existence for thousands of year. The search for the sources of India's strength and for her deterioration is long and complicated. Why this should have happened so is more difficult to unravel. When the history of civilization of ancient India started? No historian, no scientist, no philosopher can tell the exact date and how much development of science was in ancient India. As much research as going on, the date is going back and back. How much development of science in ancient India was? It is beyond our imagination. Today what we see in the development of science from missile (without fail the target) to atom bomb, from car to airplane/rocket, etc., all were written in our religious epics viz. Vedas, Ramayana, Mahabharata, Sri Bhagavad Gita and other books of ancient India. From these books we have come to know that Physics, Chemistry, Astronomy, Mathematics, Biology, Medical Science, Astrological Science, all were very much developed in ancient India. 5000 years ago or more, the Indians were worshiping the 9 planets of our solar system, when the rest of the world did not know about planet. We can say that today's development

of science has achieved the clue from the science of ancient India. Many things in ancient India were developed when the rest of the world could not start to think. India discovered the shape of Earth, the earth moves round the Sun and other information of the solar system and the universe when the people of the rest of the world had no idea or knowledge about these. India had given the world class mathematic innovation from "ZERO (invented by Aryabhatta)" to "INFINITY (invented by Bhaskaracharya)". All these are reserved patent on the name of India. All the great innovations in mathematics had got found in India. All the ideas are destroyed or stolen or not documented. Ancient Indians said, Earth is round in shape and revolves/moves around the sun, while others were busy claiming earth is flat. But now, the people who laughed at Indians are agreeing that India was the hub of knowledge. Yes, Dr George Gheverghese Joseph from the University of Manchester has revealed that several inventions and discoveries that were originally the work of Hindus were hijacked by foreigners at the course of time. [10] So**, ancient India is the origin of so many inventions and discoveries of today's modern science and technology of the world. Here we discuss the origin of the law of motion, which is the back bone of classical Physics.**

Objectives: The objective of the study is to search the actual origin of laws of motion even before Newton's laws.

II. METHODS AND MATERIALS

This study is descriptive type of research. The data is gathered through secondary sources like books, articles, websites and web-based journals published in different times.

Analysis: The different materials collected from the different sources have been scrutinized, verified and set up systematically under appropriate heading in such a way to hold requisite presentation and conclusion.

III. RESULTS AND DISCUSSION

Invention of laws of motion

There are two great scientists behind the invention of law of motion: (1) Rishi Kanada and (2) Sir Isaac Newton (1643-1727). We, all are familiar with Newton's Laws of Motion that Sir Isaac Newton, the physicist who formulated the laws of motion first. He published these laws in his book 'Philosophica Naturalis Principia Mathematica' on July 5, 1687.

But before Newton, the laws were discovered by Indian scientist and philosopher Rishi Kanada who had given Vaisheshika Sutra in 600 BCE which describes the relation between force and motion. We first discuss the Newton's three laws of motion.

First law

Newton's first law states that every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force.

Newton's first law of motion refers to as the law of inertia. Newton's first law of motion is often stated as: an object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force. That is in an inertial frame of reference; an object either remains at rest or continues to move at a constant velocity, unless acted upon by a force.

Second law

Newton's second law states that the rate of change of momentum of a body is directly proportional to the force applied, and this change in momentum takes place in the direction of the applied force.

In an inertial frame of reference, the vector sum of the forces P on an object is equal to the mass m of that object multiplied by the acceleration **f** of the object: $P = mf$ (where mass m is constant). Newton's second law of motion pertains to the behavior of objects for which all existing forces are not balanced. The second law states that the acceleration of an object is dependent upon two variables: the net force acting upon the object and the mass of the object.

Third law

To every action there is always equal but opposed reaction or the mutual actions of two bodies upon each other are always equal, and directed to contrary parts.

That is, when one body exerts a force on a second body, the second body simultaneously exerts a force equal in magnitude and opposite in direction on the first body.

Newton's laws of motion are three physical laws that together laid the foundation for classical mechanics. They describe the relationship between a body and the forces acting upon it, and its motion in response to those forces. More precisely, the first law defines the force qualitatively, the second law offers a quantitative measure of the force, and the third asserts that a single isolated force does not exist. These three laws have been expressed in several ways over three centuries.

Rishi Kanada's Sutra: Now we discuss Rishi Kanada's Sutra (law).
Kanada's Sutra is also called Vaisheshika Sutra written in Sanskrit text authored by Rishi Kanada in ancient India. Rishi Kanda is also known as Kashyapa. Vaisheshika Sutra discusses the role of gravity in falling of objects. It gives through the analogy of arrow. First it gives mechanism of arrow projection in Sutra 5.1.17 (i.e., projectile).

The first action of arrow is from impulse; the next action is resultant energy produced by the first action, and similarly the next. Then it explains why it falls in next Sutra. Now we discuss in detail.

The Rishi Kanada's Vaisheshika Sutra[5, 6, 11]

First Sutra

वेगः निमित्तविशेषात कर्मणो जायते | [**Vegah Nimitta Visheshat Karmano Jayate].**

Translation: Change of motion is due to impressed force.
(The law states that an object at rest tends to stay at rest and an object in motion tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced force.)

Second Sutra

वेगः निमित्तापेक्षात कर्मणो जायते नियतदिक क्रियाप्रबन्धहेतु | **[Vegah Nimitta Pekshat Karmano Jayate Niyatdik Kriya Prabandha Hetu].**

Translation: Change of motion is proportional to the impressed force and is in the direction of the force.

Third Sutra

वेगः संयोगविशेषविरोधी | **[Vegah Sanyog Vishesh Virodhi.]**

Translation: Action and reaction are equal and opposite.

Comparison between the laws of motion of Sir Isaac Newton and the Sutra of Rishi Kanada			
Indicator	**Newton's Law**		**Rishi Kanada's Sutra**
Time of Invention	1687 AD		600 BCE
First Law	Every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force.		"Vegah Nimitta Visheshat Karmano Jayate". It means "Change of motion is due to impressed force".
Comparison	There is no intrinsically difference between the Newton's law of motion and the Kanada' Sutra.		
Second Law	Newton's second law states that the rate of change of momentum of a body is directly proportional to the force applied, and this change in momentum takes place in the direction of the applied force.		"Vegah Nimitta Pekshat Karmano Jayate Niyatdik Kriya Prabandha Hetu". It means that Change of motion is proportional to the impressed force and is in the direction of the force.
Comparison	Both the laws are bearing same meaning.		
Third Law	To every action there is always equal but opposed reaction.		" Vegah Sanyog Vishesh Virodhi." It means that action and reaction are equal and opposite.
Comparison	Both the laws are same and identical.		
Overall Explanations	Sir Isaac Newton published these laws in his book 'Philosophica Naturalis Principia Mathematica' on July 5, 1687 while the exact time of Rishi Kanada' Sutra is not known. From the ancient religious book/epics it is known to us that the time period of Rishi Kanada is 600 BCE. The invention of the Sutra by Rishi Kanada was before the time of innovation from "ZERO (invented by Aryabhatta)" to "INFINITY (invented by Bhaskaracharya)". So far as I understand, on account of scarcity of digits Rishi Kanada could not formulate his Sutra. On the contrary, the time period of Sir Isaac Newton was so far modern and at this time many things were either invented or discovered. As a result he could formulate his laws very easily in scientific way. Now question arises how the Newton's law and Sutra of Rishi Kanada are more or less same.		

	The people of the rest of the world knew that India was a home of Knowledge and Wealth on account of which many warriors attacked India so many times in search of wealth and many wise men came to India in search of knowledge. It is proved that ancient books of India were the root of many inventions/discoveries in the world. Sir Isaac Newton might search this knowledge from India and formulated in scientific way or he could invent independently. The actual fact remains mysterious. But all credits and respects go to Sir Isaac Newton and nothing to Rishi Kanada, though Rishi Kanada invented the entire laws before 2000 years of Sir Isaac Newton. This is very painful to every Indian. Last of all, I would say that Sir Isaac Newton formulated the laws of motion in more scientific way with the help of digits and letters qualitatively as well as quantitatively while Rishi Kanada had stated the laws qualitatively.

Some More Examples

J. Robert Openhymer, the father of Atom bomb has invented it after the study of the Hindu Epic Vedas, Puran and Srimad Bhagavad Gita. The destruction through the application of Brahmmastra and other different weapons in the war of Kurukshetra and Lanka was studied by him. His mission under a team of scientists was named 'Trinidi' from 1939 to 1945 under his leadership. The first atom boom was tested on July 16, 1945.

Now John Dalton is the father of today's application of atom boom. Rishi Kanada wrote the law of atom boom in the Vedas. The famous historian J. N. Kolebrok wrote in his book that Rishi Kanada had more knowledge in comparison to the European scientists [7, 8].

The ancient genius Aryabhata calculated the exact value of Π and invented '0' (Zero) first. He first examined that the earth moves round the sun. He discovered before one thousand years than the European scholar's discover. Aryabhata was born in Kusumpur village in Bihar of India. He wrote a book 'Aryabhataiyo' in 600 B. C. The book is full of scientific knowledge [9].

Causes of Decline of Ancient Scientific Knowledge and its Applications

Ancient Indians were excelling in many fields of science. But the ancient science has deteriorated gradually for many reasons. As Nehru puts about the ancient science, "The urge to life and endeavors becomes less; the creative spirit fades away and gives place to the imitative, where triumphant and rebellious thoughts have tried to pierce, the mysteries of nature comes the wordy commentator with his glosses and long explanations. The urge to adventure and the overflowing life which led the distant colonization and transplantation of Indian culture fades away. And in this place comes narrow orthodoxy which even taboos the crossing of high seas. A rational spirit of enquiry so evident in earlier times which might have led to the further growth of science is replaced by irrationalism and a blind idolatry of the past". [1]

Why did ancient science decline?

There were so many issues and causes of decline of ancient science in India. Domination of the Brahamana over the society, Casteism, Political issues, Social issues, Religious issues, etc. were lying behind the decline of ancient science. These are explained below.

Political Issues: In most of the ancient time India was divided into many small kingdoms. Small kingdoms, frequent changes in dynasties and Kings with different approaches to knowledge prevented the development of science. The kings engaged many times in war, conspiracy and dominated over others. Very few kings tried to develop the scientific activity. Kings used science for purposes of power to control the people and to conquer over the war against the other kingdom. They kept themselves busy to develop the military hardware items.

Foreign Attack: As the rest of the world knew that India was the home of wealth, the wealth of India was attracting many invaders all over the world. The kings of small kingdom could not defend themselves from the attack of invaders. Again the kings were not in united among themselves. As a result the invaders easily got victory over them.

Institutionalization Issues: Frequent changes in dynasties and kings with different approaches to knowledge prevented institutionalization. Some universities were known to us, which were the centre of knowledge. But all were destroyed by the invaders. Owing to the absence of Institutionalization of education, the continuity and accumulation of knowledge and expertise did not take place. If the knowledge was institutionalized**,** then the knowledge would be more developed step by step and preserved.

Casteism: Casteism became the most important reason for lack of scientific development and diffusion of knowledge. The Brahamana were the master and ruler in the society. They were the educated elite. The lower class of the society had to obey them and abide by the rules imposed by the Brahamana in the society. The

practitioners and custodians of science were the Brahamana. They represented the educated elite and they dominated socially. Scientific activity and knowledge remained a preserve of the elite while arts and crafts remained with the less privileged groups. The educated elite who developed knowledge, used principles and the rationality for their own purposes but for the common uneducated people, they developed and propagated myths, dogmas, superstitious beliefs and the mantras to make them conform. As the society was mainly agriculture based, study of planetary movements and prediction of monsoons became imminent. This led to development in astronomy which later transformed into astrology. So, making people to abide by was made simpler for the elite. Again to get education and to go through the religious book were not the right of the lower class of people. Therefore, the widening of scientific knowledge and creation of theoretical understanding of the problems were hampered by the social practice of casteism. The education in general and science in particular were the preserves of the higher-caste people and lower-caste were not given any taste of education. This greatly affected the scientific progress of India.

Social Issues: Unlike the present society of unending development with unending demand on natural resources, ancient society was almost stable. Though kings might come and go with various religious and other beliefs, the basic fabric of the society remained the same; it was unaffected. According to Al Pacey "The kind of technology which any society develops must depend on its utility to mobilize labour for relevant skills and to encourage innovation". Owing to the fact that, India largely remained an agricultural society, no new challenges arose to create new knowledge to solve problems. As the proverb goes Necessity is the mother of invention, there was no need for innovations, and so no great technological breakthrough happened. It is said that the harsh winters in Europe with very short days had led to the invention of electric bulbs, heaters and other amenities of life. But the mild climate in India made life more comfortable than in Europe which is one of the reasons for absence of technological advancement. Moreover, the population had a limited growth owing to large child mortality, mortality due to epidemics and incessant wars. Therefore there was abundance of natural resources but only limited demand on them. [3]

Religious Impact: During the medieval period, the Muslim invaders attacked so many important places of India frequently, destroyed the Hindu Temples and killed the temple priests (educated elite group). The Hindu temples were the centre of preserving religious books and knowledge. Nalanda Vishwavidyalaya was destroyed by Mamluk Dynasty of the Delhi Sultanate under Bakhtiyar Khalji in 1193. Somnath temple was looted, destroyed and the entire temple priests were massacred by Sultan Mahmud Ghaznavi in 1026. The original Kashi Vishwanath Temple was demolished by Aurangzeb, the sixth Mughal emperor who constructed the Gyanvapi Mosque atop over the original Hindu temple. Kashi Vishwanath was among the most renowned Hindu temples of India. Even today the pillars and the structure of the original temple can be clearly seen. Like those, there are so many examples.

IV. CONCLUSION

From the above discussion, it is a fact that ancient India was the leader of science in all fields of the world. But the invention and discovery in India were not properly documented. If we compare today's science with that day's science, we see that the science in ancient India was more developed than today's science in some fields. For example, Khajuraho Temples, one of the most beautiful medieval monuments built by the Chandella ruler between AD 900 and 1130, Iron pillar nearby Qutub Minar and other many historical monuments in India are unbelievable on the ground that how did the then people construct? In the last 1000 years, we, the Indians were suppressed by different Muslim Dynasties and last of all, the English (190 years) on account of which we could not develop our own ancient science. The British imposed their western education upon us but never tried to revive our ancient knowledge. If our ancient knowledge would have revived and developed, our position might have become unique in the world. After getting independence from the control of foreign rulers, the sociological clutches are released slowly. So India is making strides to become self-reliant in every field of science.

Commitment: I would not like to hurt any person. If any gentle person wants to verify the truth, he/she can do with the help of following references.

Dedication: I have dedicated this article in the name of Lord Sri Krishna, Who governs the universe and enlightens the whole world through His science.

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