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An Analysis of Neglect of the Contribution of Non Western Mathematicians in the Development of Modern Mathematics

Mathematics

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ABSTRACT

History of Mathematics cannot be traced to any specific culture, race, religion, caste, region or country. The initial developments took place in India, China, Middle East, Egypt and Greece and infact then the developments travelled throughout the world due to reasons of interaction among the societies, business relationships, spread of religions, scientific interests, etc. However, due to reasons as colonialism of the Asian world by the European countries and later on, the dominance of American countries in the economic and educational world, it appears that the development of mathematics in the Asian countries could not be later traced to them and in fact these are now presented as if the mathematical inventions and contributions have been due to research in the field of Mathematics in the Western World.

Introduction

The tradition of mathematics is a long and glorious one. Along with philosophy, it is the oldest venue of human intellectual inquiry. It is in the nature of the human condition to want to understand the world around us, and mathematics is a natural vehicle for doing so. Mathematics is also a subject that is beautiful and worthwhile in its own right. A scholarly pursuit that had intrinsic merit and aesthetic appeal, mathematics is certainly worth studying for its own sake. (Krantz, S.G., 2007)

The interesting thing about mathematical concepts is that we can trace their development or discoveries throughout history. Most cultures of the ancient world had some form of mathematics, and these basic skills developed into what we now call modern mathematics. (Fett, B., 2006).

Opinions will probably always differ about the "correct" beginning for the prehistory of mathematics, but a few things are clear. Both archaeology and anthropology show that most if not all human cultures have had at least some crude concepts of numbers, with some of the earliest archaeological evidence scientifically dated around 30,000 years ago. (Burton, D.M., 1997)

Contribution of Non Western Mathematicians in the Development of Mathematics

It is now widely accepted that many scientific ideas flowed from one civilization to another across the Eurasian landmass over the millennia. Classical Indian astronomy took the idea of epicycles from the Greeks; pre-modern Europe took the idea of the present system of numerals from India (through the Arabs); ideas on trigonometry have moved back and forth; India was in close contact with Babylonia since around 2000 BCE and acquired the sexagesimal system, still in use for measuring angles and some other quantities all over the world. (Narasimha, R., 2007)

Of all the school subjects which were imposed on indigenous pupils in the colonial schools, arguably the one which could have been considered the least culturally-loaded was mathematics. Even today, that belief prevails. The conventional wisdom was that mathematics was culture-free knowledge. After all, the popular argument went, two twos are four, a negative number times a negative number gives a positive number, and all triangles have angles which add up to 180 degrees. These are true statements the world over. They have universal validity. Surely, therefore, it follows that mathematics must be free from the influence of any culture? There is no doubt that mathematical truths like those are universal. They are valid everywhere, because of their intentionally abstract and general nature. So, it doesn't matter where you are, if you draw a flat triangle, measure all the angles with a protractor, and add the degrees together, the total will always be approximately 180 degrees. Because mathematical truths like these are abstractions from the real world, they are necessarily context-free and universal. But where do 'degrees' come from? Why is the total 180? Why not 200, or 100? Indeed, why are we interested in triangles and their properties at all? The answer to all these questions is, essentially, 'because some people determined that it should be that way'. Mathematical ideas, like any other ideas, are humanly constructed. They have a cultural history. The anthropological literature demonstrates for all who wish to see it that the mathematics which most people learn in contemporary schools is not the only mathematics that exists. (Bishop, A.J., 1990)

To a typical historian of mathematics today, if there is one certainty, it is that Isaac Newton (1642–1727) and Gottfried Leibniz (1646–1716) were the first to 'invent' a generalised system of infinitesimal calculus, an essential prelude to modern mathematics. However, at least two hundred years earlier, the astronomer-mathematicians of Kerala, notably Madhava of Sangamagrama and his disciples, had discovered elements of that calculus, the forerunners of modern techniques used in mathematical analysis. Given the existence of a corridor of communication between Kerala and Europe, especially from the sixteenth century onwards, and the crucial importance of calculus in the growth of modern mathematics, one would have expected that the possibility of the transmission of the Kerala mathematics westwards would be high on the agenda for historical investigation. That such an investigation has not yet been carried out may reflect, in our view, the strength and the pervasive nature of Eurocentrism in the history of science. (Almeida, D.F. & Joseph, G.G., 2004)

Eurocentricism in the Development of Mathematics

It is without doubt that mathematics today owes a huge debt to the outstanding contributions made by Indian mathematicians over many hundreds of years. What is quite surprising is that there has been a reluctance to recognise this and one has to conclude that many famous historians of mathematics found what they expected to find, or perhaps even what they hoped to find, rather than to realise what was so clear in front of them. (O'Connor, J.J. & Robertson, E.F., 2000)

Philosophy and religion are closely related. Both deal with metaphysical reality. Perhaps surprising to the contemporary reader is that mathematics and religion have also been closely related throughout history in many cultures. Even

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in Western Europe where science and religion are often considered antithetical, the Vatican has maintained an astronomical observatory that was founded in the sixteenth century and is still today an important center for scientific research. In South Asia, sophisticated mathematics grew from the attempt to predict celestial phenomena. It was the priests who had the time and the intellectual training that enabled them to pursue this study. And the priests had an incentive: To understand the workings of the heavens is to come closer to understanding the nature of transcendent reality. (Bressoud, D. & Laine, J., 2003)

Several books have been written on the history of Indian tradition in mathematics. In addition, many books on history of mathematics devote a section, sometimes even a chapter, to the discussion of Indian mathematics. Many of the results and algorithms discovered by the Indian mathematicians have been studied in some detail. But, little attention has been paid to the methodology and foundations of Indian mathematics. There is hardly any discussion of the processes by which Indian mathematicians arrive at and justify their results and procedures. And, almost no attention is paid to the philosophical foundations of Indian mathematics, and the Indian understanding of the nature of mathematical objects, and validation of mathematical results and procedures. (Centre for Policy Studies, 1990)

India has a rich tradition of intellectual inquiry and a textual heritage that goes back to several hundreds of years. India was magnificently advanced in knowledge traditions and practices during the ancient and medieval times. The intellectual achievements of Indian thought are found across several fields of study in ancient Indian texts ranging from the Vedas and the Upanishads to a whole range of scriptural, philosophical, scientific, technical and artistic sources. However, the knowledge of India's traditions and practices has become restricted to a few erudite scholars who have worked in isolation. (Singh, J., 2012)

While Western scholars have been studying traditional Indian mathematics since the late eighteenth century and Indian scholars have been working hard to assemble and republish surviving Sanskrit manuscripts, a widespread appreciation of the greatest achievements and the unique characteristics of the Indian approach to mathematics has been lacking in the West. Standard surveys of the history of mathematics hardly scratch the surface in telling this story. Today, there is a resurgence of activity in this area both in India and the West. The prosperity and success of India has created support for a new generation of Sanskrit scholars to dig deeper into the huge literature still hidden in Indian libraries. Meanwhile the shift in the West toward a multicultural perspective has allowed Westerners to shake off old biases and look more clearly at other traditions. (Plofker, K., 2008)

Mathematics, in its early stages, developed mainly along two broad overlapping traditions: (i) the geometric and (ii) the arithmetical and algebraic. Among the pre-Greek ancient civilizations, it is in India that we see a strong emphasis on both these great streams of mathematics. Other ancient civilizations like the Egyptian and the Babylonian had progressed essentially along the computational tradition. A Seidenberg, an eminent algebraist and historian of mathematics, traced the origin of sophisticated mathematics to the originators of the Rig Vedic rituals. (Dutta, A.K., 2002)

One of the major casualties in the Eurocentric view of mathematics has been the ignoring or undervaluing of the contributions to mathematics of the Indian subcontinent. Although the invention of zero by mathematicians of the Indian subcontinent has long been acknowledged, the significance of this as the lynchpin of the decimal place value system is often underestimated. The Indian development of decimal numeration together with the place value system is the most remarkable development in the history of mathematics, as well as being one of the foremost intellectual productions in the overall history of humankind. There is a misrepresentation of the intellectual significance of these developments without which the modern conceptions of number (including its computerization, with all of the applications this brings) would not be possible. (Ernest, P., 2007)

CONCLUSION

As the available literature on the issue of development of Mathematics through the centuries exhibit, the History of Mathematics cannot be traced to any specific culture, race, religion, caste, region or country. The initial developments took place in India, China, Middle East, Egypt and Greece and infact then the developments travelled throughout the world due to reasons of interaction among the societies, business relationships, spread of religions, scientific interests, etc. However, due to reasons as colonialism of the Asian world by the European countries and later on, the dominance of American countries in the economic and educational world, it appears that the development of mathematics in the Asian countries could not be later traced to them and in fact these are now presented as if the mathematical inventions and contributions have been due to research in the field of Mathematics in the Western World.

Without doubt, the present day Mathematics as it is understood and studied got its formal design only during the nineteenth and twentieth centuries in the Western World, but then as it is known, no knowledge develops in vacuum. There has to be some background work and basic knowledge on the basis of which new knowledge develops and makes the discipline easy to understand and to comprehend. Mathematics is no different.

The history of Mathematics is the history of mathematical interests and inventions in the Asian countries and finally taking the formal shape in the Western World. Not to say then, there has been strong role of cross cultural influences on the Development of Mathematics, which has been throughout neglected in the Western World and is propagated as if all the Mathematical Concepts have found their development in the Western World only. There appears to be gross non acceptance of contribution of the countries and regions outside the western world. This fallacy is now being corrected by the Mathematicians both in the Western World as also in the non-Western World.

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