

# Recollecting the Unknown Truth of the Genesis of Map-Making in Bengal

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Maps play a key role in the history of human civilization. Good maps are essential in determining the location of places, in establishing connections among nations through roads, rail and airways, and facilitating trade.<sup>1</sup> The Bengali word Manchitra is more expressive than its English counterpart 'map'. As its definition one can say, the design or picture that is drawn according to certain measurements and which gives a visual idea of a certain nation or a region is called a Manchitra or map. The Cartographies wrote in 1984:<sup>2</sup>

□ A map is a replica of the world or one of its regions we hold in our hands. It is a picture that gives as much information at a single glance as a book gives after - a rigorous reading of many pages.

□ To peruse a map is not only to see it; one has to read it as well and think about what one is looking at and what its general features are.

The goal of drawing a map is to produce before the viewer a simple yet aesthetic visual representation of the earth's surface and its diverse forms. This drawing process is a mixture of science and art. This is called cartography. History shows that people have been using maps for various requirements of their day-to-day life since much before the birth of Christ. We notice the development of various and increasingly efficient scientific techniques of drawing maps with the advancing of civilizations. In this writing, we will know how the ancients made and used maps and how those techniques led to the gradual development of the latest satellite-based cartographic methods.

Since time immemorial, the life of humanity has been regulated at first by nature and then in varying degrees by our own increasingly complex activities. In the early stages of civilization, mankind was nomadic. They roamed around from place to place in small groups in search of the basic requirements of life, such as food. It is needless to say that at this level their lives were completely regulated by nature. To find their way in the wilderness they had as their guides the sun in the sky and the elements of nature all around them, like trees, rocks and streams. Through regular encounters with these natural features of their surroundings, they automatically formed a rudimentary map of their dwelling place in their mind. This is what we might call a 'mental map'.<sup>3</sup> As a part of their nomadic lifestyle, they moved from place to place and continuously deleted maps of older places and created those of the new. They depended on their natural observation and past experience with the environment in creating these mental maps. It is believed that human civilization developed into its next level with the invention of agriculture about ten thousand years ago. This necessitated accurate measurements of arable land. Thus they found another crucial use of their mental maps, which were still imagined but presumably more sophisticated and nuanced according to the demand of the new lifestyle. Gradually they began to draw pictures of their environment on rocks and the ground. A clay

disk from 2300 BC with remains of what is speculated to be an attempt at drawing a map has been discovered in Babylon.<sup>4</sup> The Sumerian concept of the universe was strange indeed - the earth was supposedly a flat disk floating on a vast ocean. Heaven was a hemisphere covering it and touching it along the obscure line of the horizon. This civilization divided the centre of the circle into 360 degrees and introduced the 60-60-60 rule in angular measurement.<sup>5</sup> They were the founders of systematic cartography.

The ancient Egyptians established their civilization along the banks of the Nile. Pharaoh Rameses II introduced land measurement, documentation and determination of its boundaries. It is no wonder that the experts of pyramid building were adept at cartography. The excellence of their contribution is visible in the fact that later Greek scientists used Egyptian variables of astronomy and other signs in their experiments and these became standard tools for much of later research. The maps made by the Peruvian Aztecs can be considered fine examples of artwork.<sup>6</sup> The Eskimos, too, were experts of cartography. They made geographically an almost flawless map of the areas surrounding the Hudson Bay and adjacent archipelagos. This map, a product necessitated by life and livelihood, is also a document of human ingenuity.<sup>7</sup>

The Greek scholars developed and refined a number of techniques of cartography. One of them was Hecateus, who wrote a book on the geographic concepts of the earth in 500 BC. His successor Herodotus made great improvements in the methods of determining locations and directions of different places on the planet as well as measuring its shape. Pythagoras and Aristotle formulated important theories about these after him. The next phase of improvement was ushered in by the famous astronomer Ptolemy (90 -168 AD). He wrote an eight-volume treatise titled *Geographic*. He was also the first man known to have drawn a detailed world map,<sup>8</sup> even though his concept of the shape and structure of the planet had inevitable flaws. In the East, the Chinese had made significant progress in cartography. The first trade links between India and China were formed following these maps. Maps drawn on paper were first introduced in China in 1155 AD. The Europeans were at least three centuries behind.<sup>9</sup>

In the fifteenth and sixteenth centuries, European - and in particular Spanish and Portuguese - explorers began expanding the horizons of the known world and maps began to be drawn with newly acquired knowledge and insight. These explorers included Columbus, Vasco da Gama, Amerigo Vespucci, Magellan et al.<sup>10</sup> Ancient Greece and Rome had cultural and trade links with Asia, but till the Middle Ages Europe had no clear idea about geography and the countries outside itself. This knowledge required increased communication and exploration. In the late Middle Ages, Europeans got certain important information from the Arabians.<sup>11</sup> Besides, the geographical concepts of the Middle Ages were not very accurate. As the concept of a heliocentric universe was absent, so was any clear idea about the earth's shape. The earth was thought to be a flat disk. A glance at late medieval world maps makes this clear. These were striking in appearance but riddled with factual flaws. At the beginning of the fifteenth century, one of the major sources of information from outside of Europe was the tales of travelers. Africa was known from the tales of Arabian travelers. Europe was familiar with

the accounts of Masudi, Ibn Battuta, Ibn Haukl, El Bakari et al through translations. But these accounts were more often than not unreliable.<sup>12</sup>

The chief source of information about Asia was Marco Polo. His accounts seemed quite plausible to contemporary geographers. It was particularly suited to the Age of Reconnaissance. Henry of Portugal had read it as a manuscript. It was printed in 1483. Columbus kept a printed copy.<sup>13</sup> New maps prepared during the fifteenth and sixteenth centuries were undoubtedly helpful in the overseas explorations. In fact, the relationship between these discoveries and the maps was complimentary, because just as the latter helped the former, the former also enriched the latter with new and accurate information. It must be noted here that although many examples of medieval maps are preserved in today's museums, ancient maps are a rarity. When Ptolemy's writings were revived during the Renaissance, the restoration of his maps began. The seventh-century map preserved at the St. Gaul Monastery in Switzerland is assumed to be the oldest extant map. It shows Europe, Asia, Africa and an uninhabited zone. This map declares that after the Flood, the three sons of Noah settled in the three continents. A separate map of Europe is found in an early twelfth-century manuscript. It was probably drawn by Lambaire. But the enthusiasm for making new maps increased after the revival of Ptolemy's works. A small booklet written by John Hollywood and Saphro Bosco in the thirteenth century, titled *De Sphaera Mundi*, became very popular in the fifteenth and ran into at least thirty incunabula editions. This booklet played a key role in spreading the belief that the earth was not flat but spherical.<sup>14</sup>

In the fifteenth century, sailors made charts. These were known as 'Portolan maps'. Gregorus drew a map of Europe from Ptolemy probably in the middle of the fourteenth. Ptolemy gained popularity throughout Europe in the fifteenth century. Andreas Walsperger produced a world map based on Ptolemy in 1448.<sup>15</sup> This map shows Europe smaller than previous representations, and it mentions non-Christian settlements along with Christian ones. The geographic voyages had their influence on cartography as well. The discoveries of Columbus, Vasco da Gama and Magellan brought about a paradigm shift in the popular conception of geography, while the printing revolution accelerated the spread of all kinds of knowledge. The name of Geraldus Mercator (1512-94) is of special significance in the history of modern cartography. He prepared many globes for emperor Charles V. He published a refined edition of Ptolemy and produced the first modern map of Europe. Mercator is chiefly remembered today for his famous world maps made for sailors in 1569. As a matter of fact, this is how maps and geographical discoveries influenced each other. The *imago Mundi* by cardinal Pierre d'Ailly in 1400 brought together many pieces of information from Greek, Latin and Arabic civilizations.<sup>16</sup> This book helped Columbus later. Thus the light of new discoveries largely succeeded in dispelling the original errors of Ptolemy. The invention of the concept of latitudes and longitudes helped acquire more information which was helpful in practical sea voyages. Besides, development in astronomy and better shipbuilding also facilitated more daring expeditions.

Different European nations initiated a process of making their own modern and accurate maps at the beginning of the eighteenth century with the help of improved

measurement techniques. After the projects of France and Britain, other countries including Spain, Germany and Switzerland quickly prepared intra-national and international maps. Around this time the invention and implementation of new machines and techniques for measurement made the process of map making easier, more informative and scientific. The administrative departments of different nations started making maps at municipal and regional as well as national and international levels.<sup>17</sup> The tools initially used to make maps were chiefly compass, plain tables and ordinary telescopes. Since the eighteenth century, developments in mathematics (particularly trigonometry) and astronomy greatly improved techniques of regional measurements which were reflected in the maps. In 1925, The Royal Scottish Geographical Society produced the first true thematic maps. Bartholomew was the head of the project.<sup>18</sup>

Now to turn to India, we find a rich history of indigenous cartography. Texts such as the Padma purana and other puranas show that even two and a half millennia ago there were techniques of making maps with distance measurement and regional description. In the fourth century B.C. the Greek messenger Megasthenes visited the court of emperor Chandragupta Maurya. His accounts also reveal the presence of systematic measurement techniques in contemporary India. The *Arthashastra* by Kautilya is another standard text which is a repository of relevant information. The almost-contemporary, famous scientist Aryabhata accurately calculated the diameter of the earth for the first time.<sup>19</sup> Again, the book on India by Al-Biruni written during the early eleventh century (1030 AD) is a famous work. It discusses various India-related topics. A striking feature of this book is that it devotes a great portion of its total length to a sincere and exhaustive study of Mathematics in general and Astronomy in particular. Al-Biruni discussed Indian cartography in the fifteenth chapter of his book.

Al-Biruni's full name was Abu Rayhan Muhammad ibn Ahmad Al-Biruni (973-1048). In 1017, his native empire of Khwarezm was annexed by Mahmud, the Sultan of Ghazni. Following this, he was brought to Ghazni and later he found himself in India as a captive, with other defeated Ma'muni princes. In this phase as captive and controlled by his captors, Al-Biruni collected materials for his future book. He finished composing it in 1030. In 1888, Edward Sachau published its first English translation under the title *Alberuni's India*.

It is thought that during the reign of Sher Shah in the middle of the sixteenth century, maps to aid taxation were first devised in India. After this, Todarmal the revenue minister of emperor Akbar had maps made for an improved collection system.<sup>20</sup> In 1619, Captain William Buffen, the captain of the ship of the British messenger Thomas Roe to the court of emperor Jahangir presented the emperor with a map of the Mughal Empire.<sup>21</sup> In fact, since the sixteenth century many European merchants from Portugal, Denmark, France and other nations began to arrive at Indian shores; first along the west coast and then along the east. Before this, the Portuguese merchants had begun entering India through waterways along the west coast, particularly Kerala, since the late fifteenth century. At first, they began locating and making maps of the coastal ports such as Kochin and Cannano to enhance their profits. These draft maps also mentioned the probable hinterlands of contemporary seaports. A complete map of the Malabar coast from 1506 has been found. It was made by the Portuguese sailor Rodrigues

under the orders of the Governor of Malabar, Al Bakr. Afterward, the Portuguese explored and produced maps of many coastal regions of India, the courses of many rivers and locations of towns and cities. Thus it can be said that the Portuguese were the pioneers of cartography in modern India.<sup>22</sup>

However, the first scientific map of the whole of India was produced in 1753 by a Frenchman, the geographer Dr. D. Andeville. But notwithstanding these separate attempts, a full-fledged system of map-making was introduced in India by the British East India Company in the eighteenth century. Here it should be mentioned that after the British came to India, they had put most emphasis on geographical studies. Geography was the subject that saw the most amount of research in the nineteenth century. This was because the vast landmass of India was still largely unknown to the colonial masters. The British were drawn to the Himalayas in the north, the plains to its south, the plateau of Deccan, the hills of the east and the diverse ethnic groups and their customs. To satisfy this curiosity as well as to secure their financial needs, they started vigorous geographical studies.

Nain Singh Rawat, Sarat Chandra Das, Radhanath Sikdar, Rajendralal Mitra, Sibaprasad Chatterjee et al have presented much before us through their works. Sarat Chandra Das was no cartographer. He had acted as a spy of the British and crossing the Himalayas, had gone to Tibet undercover. This is the reason for the rich cartographical material found in his writings. The name of Radhanath Sikdar must also be mentioned here. When Bengali thought was clouded over by pettiness and superstition, he had done complex researches simply by mathematical calculations and primitive tools. Rajendralal Mitra was one of the pioneers of science in nineteenth century Bengal. While writing a geography book he felt the importance of maps and resolved to produce an atlas in Bengali. The result was *The Bengal Atlas: A Series of Original and Authentic Maps of Most of the Districts Included in the Lieutenant Governorship of Bengal*. Despite its English title, the maps themselves were in Bengali. Besides publishing maps of India in Bengali, Rajendralal Mitra also published maps of all the districts of Bengal, Bihar and Orissa (1868) and their physical charts (1854). Apart from this, he had produced a map of India in Devanagari script and another map of India and one of Asia in Persian script for the state government of the North Western Frontier Provinces. In 1767 the office of the Survey of India was opened in Calcutta and under the supervision of British officials began preparation of maps of contemporary Bengal and its neighbouring regions. The first Surveyor General of India was James Rennell (1767-1777) who supervised the production of the first map of Bengal which is still regarded as an invaluable historical treasure of the region. The same office produced a complete map of Hindustan in 1885.<sup>23</sup>

Lambton introduced it in practice from St. Thomas Mount in Madras. The project was finished after his death by George Everest. Many of the GTS towers made by him for this purpose can be seen even in today's West Bengal, including one in Kolkata. Maps of almost all Indian regions were formed in this process between 1823 and 1905, leaving out only a few. In this context the name of Radhanath Sikdar is memorable - he measured the height of Mt. Everest.<sup>24</sup> The Indian Mutiny of 1857 came as a blow to the contemporary Indian administration. Although technically the mutiny was suppressed, yet the British officialdom

faced tremendous losses and the British Parliament realized that the administration of as vast a country as India cannot be left in the hands of the East India Company. Immediately after this, the administration of India went under the direct control of the British Crown. The British understood the necessity of detailed geographic and cultural maps in order to make the Indian administration more efficient.<sup>25</sup> Such maps were already prepared under the Ordnance Survey in Britain. These were called topo sheets. From 1860 a project was undertaken to produce similarly detailed topo sheets of all the regions of India under the supervision of the Survey of India. The entire landmass of India was divided into squares of 15'X15' and officials went on the field to make accurate and detailed maps of these squares. As a matter of fact, the making of these topo sheets was a difficult task at that time. One British officer went to each topo sheet region, gave the local people rudimentary training and spent months on fields preparing maps and charting reports. The tools used in the survey included dumpy level telescopes, ebony level and prismatic compass and plain tables. Of course, measuring tapes and plumb-bobs were there too.<sup>26</sup>

Such survey teams worked tirelessly in the dangerous forests of Deccan and the Himalayas, the alluvial plains and the Thar desert. The topo sheets corresponding to the entire territory of India were prepared between 1861 and 1925, i.e. roughly within 65 years. These were the first treasure survey maps of India. In the 1860s and 70s two English photographers Bourne and Shepard spontaneously worked with the surveyors, went on foot across India and took a huge number of photos of its terrains, these photographs were not only sources of invaluable information about contemporary India. In many cases they became complementary to the maps themselves. The famous Bourne and Shepard library in Kolkata has many of these photographs well preserved.<sup>27</sup>

Another kind of map was produced in British India. These were the cadastral maps. In British India, each rural and urban area was located and its map was produced as a cadastral area. These maps were projected on 16 inch mile scale. The cadastral maps of each locality are preserved in the office of the block engineer.<sup>28</sup> After independence the mile scale of these maps has been converted into kilometer scale. In 1956 the central government established the National Atlas Organization in Calcutta under the supervision of the renowned Indian geographer Sibaprasad Chatterjee. This organization aimed to produce maps of different regions of India for different administrative needs based on all available information. It should be mentioned that Sibaprasad Chatterjee was born in 1903 in Calcutta. He is regarded as the father of modern Indian Geographical studies. He was a polymath and he had inspired many geographers from later generations.<sup>29</sup> He dreamt of establishing a geographical society based on thoroughly Indian outlook and procedures. Calcutta was the hub of geographical studies in undivided India. Therefore he established the Calcutta Geographical Society in 1936 which later became the Geographical Society of India. But the most important contribution of Chatterjee is the establishment of the NATMO. It should be mentioned that this organization has a fascinating history of the establishment. Chatterjee was the first to publish a National Atlas of India which would contain all geographical information about the country.<sup>30</sup> The central government was enthusiastic about this plan because Chatterjee had successfully upheld

at the national level the importance of various benefits of the project. Prime Minister Jawaharlal Nehru gave the green signal for the establishment of NATMO in 1956. Following this, the National Atlas Organization was formed with Sibaprasad Chatterjee as its honorary director. The first product to come out of it was the National Atlas of India. Later it became a series and was published in a number of volumes. The series was praised all over the country. As a result, Chatterjee obtained the Murchison grant from the Royal Geographic Society.<sup>31</sup> In 1960 the Indian government requested Chatterjee to produce a complete irrigation map of India. This resulted in the *Irrigation Atlas of India* in 1970. In 1978 the name of NATMO was changed to the National Atlas and Thematic Mapping Organization.<sup>32</sup> Chatterjee was connected to different international organizations as an acclaimed geographer. In Stockholm in 1960, he was in charge of the Geographical Cartography and Photography section in an intentional conference. All in all, the goal of Sibaprasad Chatterjee's colourful life seems to be not only a systematic and abstract study of geography but a more emphatic focus on its practical side and an extraordinary level of activity to bring benefits to the common people of India.

Today it has been made possible to improve the map-making system with the GIS and thereby on a par with world technology. This may be a good place to mention that the ancient Indian poet Kalidasa gave a picturesque description of the east coast of India in his poem Raghuvansham. King Rama is on his way back to Ayodhya with queen Sita in the flying chariot Pushpak. He describes :

*Duradayashchakra nibhasya tanwi  
Tamalatali vanaraji neela  
Abhati beta lavanamburashe-  
Rdhara nibaddheva kalankarekha.*<sup>33</sup>

What is worth noticing is that the chariot is similar to modern aircraft. While riding it Rama can see the surface as if with a bird's eye view. Seen from far away and high above, the shining sands of the beach make it look like an iron disk, on which the vegetation borders like specks of rust. This is poetic imagination, but it is also the height of sensitivity.

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