According to a popular indigenous proverb in the nineteenth century north west frontier region:

First comes a white man for innocent travel, then come two white men to draw a map, next comes an entire contingent to conquer the land.

This is at once a reminder of cartography's military rationale as of its symbolic function. The temporal sequence might not have always been the same, but the interconnected nature of the three definitely holds ground. They indicate both the logic and progression of spatial mechanism and the structural affinities between them. Seemingly disparate cultural practices of travel and cartographic art attained militaristic colouring as a direct fallout of imperial schemes of spatial aggrandisement. By systematically amassing topographical and statistical data, thereby subjecting them to the cartographic grid, cartography converted space into a visible object of knowledge which could be controlled, occupied and managed. As it transpired in England's first empire, eventuating into a spatial reorganisation into what came to be known as Great Britain, so the space produced by the cartographic transaction in South Asia enabled a spatial transformation redefining an organic space into a functional space - that of the colony. This semantic transfer of the organic space into a functional space through the technology of the map proved to be decisive in defining a geo-political entity, making what came to be known as modern India.

That this was entirely a British device can be established from studying the history of the maps on and in India. Their eventual transition in the latter half of the eighteenth century along with their evolution and trajectory thenceforth, manifest an imperial design to articulate colonial territory. The Mughal empire itself, on which British empire was modelled, did not extend beyond the Deccans, the southern peninsula being ruled by numerous petty kings and provincial princes. The consolidation of the culturally disparate regions under a single scopic regime is the consequence of the cartographic image.
The construction of a monolithic or universal space was the imperial endeavour. It constructed space as a measurable entity, a finite entity. It embraced the Euclidean and Cartesian concept of the measurable space constructed and verified by the mathematical web. The two dimensional representation of the infinite space helped to reduce it to a comprehensible finitude. Imperial cartography and homogeneous mapping practices encouraged the construction of space in positivist terms, where alternative perceptions of this objective space was never given credence. To think of space as that which could be produced socio-culturally or that varied cultures could produce various spaces, would make colonial constructions impossible. Therefore the native inhabitants were not allowed to have a space different to that of the coloniser. They were merely thought to have under-utilized space which imperialism only took to its natural culmination. The construction of the monolithic space enabled imperialism to annex and hierarchize space, to use it for its own advantages. Colonial cartography involved two stages of acting upon space: firstly, the erasure of pre-existing indigenous spaces to recast it in universal terms and secondly, inscribe universal space with power to outline a material place in the colonial consciousness. In this chapter I shall concentrate largely on the representational strategies which served to foreground the colonial sphere, but from which emerged the space of the future nation/country with seemingly naturalized boundaries. Drawing upon the theory of socio-political space as developed by Lefebvre, this shall be an analysis of how space is actively produced, in this case by scientific discourse surrounding cartography, necessitated by imperialism. Looking at the historical sequence of map production techniques and the cultures of mapping in a single region, can lead to crucial insights into the changing understanding of the shape and extent of a given geographical space and unravel a system of cultural meaning which determine social relationships.

**Early ventures in mapping India**

What was understood as India in the West has an intriguing history. Till a considerable part of the eighteenth century, there was no clear idea about the extent of what was called India. Merely, the location of some of the important sea ports were known through the existing Portolan maps or sea charts due to the flourishing trade that went on between these and the West.

India has remained in the European consciousness for a long time and therefore on their atlases. Most maps show evidence of combining travellers' tales that had so far been

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390 Ryan 1996. 3-4.
published or gathered from hearsay. The early maps which survive, such as that of Ortelius, Mercator, de Jode and Hondius had all omitted certain features and selected portions. In the earlier editions of Ptolemy, the Indian peninsula is shown greatly foreshortened. Ceylon appears sometimes to the right and sometimes to the left of the peninsula. A map of the 'Indian Empire' by Bertelli appeared in Venice in 1565. In the atlas of Ortelius, India is not represented as a single entity, but grouped with the East Indies. It is decorated with the arms of Portugal, ships and sea monsters. Mercator's map likewise covers a wide area, and India is shown in an even more attenuated form. Most of these maps did not show the Himalayas. Others showed incorrect source and course of the Ganges. In a map of Asia published in 1637 by Mercator's son Rumold, the Ganges is shown flowing east to the China Sea. 'Palimbotra' is on this Ganges, while 'Delhi' is on the 'Guenga' on the peninsula. The 'Vindius' mountains are much further north than Bengal, and the lettering of 'Indostan als India intra Gangem' meaning 'India within the Ganges' starts above the Bay of Bengal and extends China to the ocean in the east.

The first English map of the 'Mogol Territories' was published by T. Sterne, globe maker on 1619. It was drawn by William Baffin on information supplied by Thomas Roe after his visit to Jahangir's court as ambassador from James I in 1615. This map was copied by Purchas in 1625 in *Purchas his Pilgrimes* Vol. I, Edward Terry's *A Voyage to the East Indies* (1628), John Ogilby's *Asia* (1673) and many others. It was also copied and published in Paris in 1663. Several small travel books, by Du Val and Mallet in France and Seller and Marden in England, provided reduced copies of Dutch maps for the northern part. In France, other maps appeared by Sanson, Jaillot, De Lisle, D'Anville and Bellin. In England maps of India featured in the works of popular cartographers like Herman Moll and Bowen, but these too were not accurate.391

Publishers were contented to reprint or copy older maps as long as their public was satisfied, for they were cheaper. Printing new maps were costly projects and involved funding and patronage. Though copying from older maps was cheaper than designing a new map, it resulted in the same mistakes being repeated again and again becoming a dogma unless there was very definite witness, preferably eye witness, to vouch for the maps being incorrect. Therefore, once a name and a rough location had been established, it was repeated long after the kingdom had disappeared or renamed. Thus the kingdom of Narsinga had been reported by the Portuguese in the 16th Century, when the kings of Vijaynagar were

391 Tooley 1952. 104.
powerful throughout south India. The town was sacked in 1565, yet Narsinga appears in maps as late as 1720. Similarly, the town of Golconda, founded in 1518, was abandoned in 1589 as it was considered unhealthy. A new capital was built at Bhagnagar and the province was annexed by Aurangzeb in 1687. It formed the centre of the Mughal province of the Deccan until Asaf Jah broke away in 1722 and built his own capital at Hyderabad. The kingdom and town of Golconda were still appearing in maps of India as late as 1780.392

In 1710, Herman Moll (d.1732) in London drew a small map which showed the whole of India on one page, the first important one to give prominence to the subcontinent as a separate entity. In 1701, he had first drawn 'India or the Mogul's Empire' which was extended eastwards to include Cambodia and Cochin-China. His second map was called 'The West Part of India, or the Mogul's Empire' and included only the subcontinent, though the name was still incorrect, for the southern part of India was never part of the Moghul empire. He redrew the map in 1726 and now called it 'India Proper, or the Empire of the Great Mogul', which shows the growing awareness in England of the identity of India, and the confusion caused earlier by the use of the name India for the whole of Asia.

The people in the best position to record the geography of India were, in fact, the Christian missionaries. They were often resident in India for many years and many of them acquired the skill necessary for taking accurate astronomical and land measurements. The Jesuits had established their first mission in 1542 and they were soon settled in many parts of the country. Father Monserrat had travelled to the court of Akbar in 1579, and then to Kabul, recording his journey in letters and a map which was not made public. From 1702 the Society in Paris arranged the publication of letters from the missions and a few maps drawn by their servants. These are usually clubbed under 'Church Cartography'. Two maps of India were published in 1722, one a very sketchy outline of a route inland, and the other a more comprehensive map of the peninsula. This had been sent home by Father Bouchet in 1719 and was used by Guillaume de l'Isle (1675-1726) in his map of south India in 1722. Later, in 1734, Father Boudier was invited to Jaipur by Raja Jai Singh to study the astronomical laboratory he had built there. On his way Boudier took many measurements which were consulted by d'Anville for his large map of India in 1752. 'Church cartography' caused the excellence in map production to shift to the hands of France.

D'Anville(1697-1782), the French geographer compiled the first modern map of India which was published in French in 1751-52, and was based entirely on knowledges

392 Gole 1983.67.
derived from the routes of various travellers recorded in history and from some rough charts of the coast. D'Anville may be called the first scientific mapmaker. His maps look rather austere and bare after the century. Geographical accuracy for him, was the primary task of a cartographer, not eye-catching embellishment. For his large two sheet map of India published in 1752, he used a number of source books from Ptolemy's lists to a Turkish geography called Kiatib-Shalebi, an Indian geographical text in Tamil which he called Puwanasaccarum, as well as books by later travellers. He was not a traveller himself but from his home in Paris he maintained a wide correspondence and received all new charts that were sent back to France especially by the missionaries. D'Anville was the first to publish all his sources for a new map of India. His Eclairissements (1753), formed the basis of Rennell's survey and memoirs years later. This set the trend for cartographers to publish their memoirs accompanying their large and 'original' maps, narrating in minute detail the many sources which formed the basis of the map and their reconciliation or the criteria by which they were accepted or rejected. Matthew Edney points out that:

[...]
a map's accompaniment by a memoir, was a sign of the cartographer's pretension that the map ought to be considered as a cartographic landmark. Through his memoir, a cartographer assured his public that a map was based on the best available sources and he displayed his own conscientiousness and intellectual virtuosity. 393

This foregrounded the map's author, the "creator of the map's knowledge" 394

**Enlightenment and the imperial surveyor: the 'aura of the scientist'**

British nationalism was directly linked to colonialism which for the British, implied the promise of wealth, investment and remittance. The activities of the East India Company aroused enormous interest and curiosity among the public especially with the Company's annexation of Bengal. The event was all the more glorified as it was a decisive territorial victory over France against which, Britain's own nationalism was pitched. As Sudipta Sen points out, the vision of territorial possession in the colonies was directly fastened to the concept of defensible and bounded property as applicable in the home nation. He further points out that the rights of the East India Company were extended not only to an exclusive trade but to legitimate possession of tangible property of a corporate body politic, that is, territory and revenue. While Sen explores texts by numerous theorists and administrators in

393 Edney 1997, 98.
394 Ibid. 100.
eighteenth century Britain to explain this point, Thomas Pownall's statement in his tract called *The Right, Interest, and Duty of the State as Concerned in the Affairs of the East Indies* (1773), which he cites, succinctly validates this argument:

People now at last begin to view those Indian affairs, not simply as beneficial appendages connected to the empire; but from the participation of their revenues being wrought into the very composition and frame of our finances; from the commerce of that country being indissolubly interwoven with our whole system of commerce; from the intercommunication of funded property between the Company and the state - people in general from these views begin to see such an union of interest, such a co-existence between the two, that they tremble with horror even at the imagination of the downfall of this Indian part of our system; knowing that it must necessarily involve with this fall, the ruin of the whole edifice of the English Empire.

The rule of property in certain ways legitimized colonial extension. Likewise, Adam Anderson, a prominent British historian of political economy in the latter half of the eighteenth century, conflates the logic of property with that of dominion in his *An Historical and Chronological Deduction of the Origin of Commerce*:

Public property excludes communion amongst nations; private property is communion amongst persons. For, as particular persons, which they possess privately of other persons: so countries and territories, like greater manors, divided each from the other by limits and borders, are the public properties of nations, which they possess exclusively of one another.

Property and land rights, as seen in the preceding chapter, are the determinants of cadastral and estate cartography in Britain, which led to a complete overhauling of previous modes of map making implanting the artistic tradition in the domain of science which perceived land as a measurable entity. As Harvey points out that this new intellectual formulation is related to other rationalizing practices which emerged during the same time in other fields such as in commerce, banking, book-keeping, trade and agricultural production under centralized land management. The new age geography gave rise to reconnaissance and field survey that dominated the British domestic scene, therefore, were automatically transposed onto Britain's empire which got enmeshed in British order of property and possession. In explicit relation to Great Britain, the homegrown formula exported not just efficient methods of structural surveillance intrinsic to mathematical surveying but a whole ensemble of views and perceptions to subordinate space. In India, the

396 Cited in Ibid. 21.
397 Harvey 1989a. 245.
defining perception of landscape was mixed with that of insubordinate groups who tyrannized and tried to disturb the well organized administrative space produced by the British in India. As Bernard Klein points out, in the case of British cartography in Ireland:

"... the map ... is ... expected to create the image of a rebel-free landscape, a plane space subject to the imperial gaze ... , pre cartography by contrast, has the rebel roaming the wild, unconquered landscape at will, escaping the grip of culture and the fixity of the cartographer's plot alike."

The colonial rhetoric surrounding the representation of India constructed its space as inherently transgressive realm of the savage rebels where renewal of political control was contingent upon the mechanism of systematic cartographic description. The surveyor's view, here, becomes identical to the perspective of power who restores the chaotic space to normalcy and order.

The professional existence of these surveyors was fashioned upon their superior technological competence. As Harvey points out, as Cartesian principles of rationality became integrated into the Enlightenment project:

"It signalled a break in artistic and architectural practice from artisan and vernacular traditions towards intellectual activity and the 'aura of the artist, scientist, or entrepreneur as a creative individual."

The cases of both James Rennell and William Lambton discussed below shall exemplify the key theme of the discourse of surveying and the tussle over claims on sophistication and technology. It heralded the new age of surveying as a carry over from General Roy and Mudge's cartographic practices in Britain. This celebrated the survey equipments where the uniqueness of the instruments defined the uniqueness of their user. The apparent novelty of geometrical thought rested finally with a claim to lay open to view, via geometry, truths otherwise unavailable. The surveyors' memoirs, in this case were merely professional in nature trying to outline the laborious process of extracting data from an immensely chaotic and disorganized mass of unchaffed information.

**James Rennell's Map of Hindoostan**

D' Anville had recently collected all existing knowledge of India, derived from routes of solitary travellers and rough charts of the coasts. His map of India appeared five years before the Battle of Plassey. Eight years after the episode, James Rennell was at work

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399 Harvey 1989a. 245.
in the newly ceded territories of Bengal and Bihar. Initially in 1760, there was an order passed by the Local Council of Bengal which wanted an accurate estimate of its revenue provinces. Once it assumed power to collect revenue on behalf of the Mughal monarch and emerged as a major territorial power, there arose several requirements for a map. As the revenue had to be based on the amount of land under cultivation, it needed to be quantified and demarcated in the Company’s new map. Moreover, in view of defence of the territory conquered, exploration of sea, river and land routes emerged as a crucial requirement. The north-west of the territory was constantly threatened by the presence of the Marathas, and at sea, the French were still a considerable power. To counter the two looming powers, strategic information needed to be gathered.

As can be safely inferred from the preceding chapter, geographical knowledge and military expediency are closely intertwined. The military surveys following the Jacobite Rebellion closely parallels cartographic activities in Bengal. In fact, scholars have pointed out the similarity between the characters of Roy and Rennell, both of whom were engineering officers, later elected fellows of the Royal Society. Rennell had entered the navy and distinguished himself as a midshipman at the Siege of Pondicherry. He took up a position with the army under Clive, rose to the rank of Major and ultimately became the Surveyor-General of India at the pinnacle of his career. Edney, however, suggests that the office was rather limited in its institutional scope and it might not have been as glorified as it appears. He was not intended to be the head of a body for organized survey for anything of the sort did not exist at the time. It was a position intended primarily for gathering geographical information and construction of maps. As it was in this sense, that the two terms, geographer and map-maker were interchangeable with each other in this age of Enlightenment, in that they provided unambiguous, coherent and comprehensive data from a whole host of disparate sources.

The immediate call for the map came from Robert Orme which he required in order to write a book on military achievements in India. In fact, as Edney points out, Orme has been a major propagator of map use in defence of the Company controlled territory. Rennell’s survey covered an area 900 miles long by 360 to 240 wide, from the eastern confines of Bengal to Agra, and from the foot of Himalayas to Calpi. The Bengal Atlas published in 1781 was compiled from around five hundred surveys conducted by him and

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ten other officers appointed under him. Alongside, he surveyed the Ganges and the Brahmaputra and several of their distributaries. The Atlas was dedicated to Robert Clive, Warren Hastings, Hector Munro, Verelst and Company.\textsuperscript{402} Rennell's was the first systematic survey conducted in the region. In fact, it could be seen as the inception of the Survey of India. Rennell's task was "to form one general chart from those already made" and therefore by compiling a final map out of the geographical knowledge already in circulation, he gave coherence to the seemingly disjointed and varied information. The drawing and control of the map thus signified both the control of the knowledge archive and the region it depicted.

The construction of India as a place was imbricated with other colonial cultural practices. Appearing at a time when colonial historiography was at its formative stages in India, the preliminary maps and surveys were used by the historian Robert Orme for his \textit{A History of the Military Transactions of the British Nation in Indostan (1745-1760)}, which appeared in 1763. Not only did the constitution of geographical knowledge of India entail a retrieval of history, it also served to write new histories as well.

\textit{The Map of Hindoostan} was compiled from the evidences of various route surveys and was first published in 1782. It subsequently went through three editions with its accompanying \textit{Memoir of a Map of Hindoostan; or the Moghul Empire} published in 1788, dedicated to the president of The Royal Society as an "attempt to improve the geography of India and the neighbouring countries". For the 1788 edition, Rennell claimed that he had collected far more information from various sources which enabled him to produce a map which was more perfect and therefore decided to draw it on a larger scale. The quantity of land represented in it was claimed by Rennell as equal to one half of Europe. As more and more facts were gathered to fill in the void inner space, the possibility of representation of 'truth' in the map increased:

\begin{quote}
Considering the vast extent of India, and how little its interior arts have been visited by Europeans, till the latter part of the last century, it ought rather to surprise us, that so much geographical matter should be collected during so short a period; especially, where so little has been contributed towards it by the natives themselves as in the present case.\textsuperscript{403}
\end{quote}

Earlier route surveys by Huddart, Pearse, and Fullarton effected an outline of the so far unknown shape of the southern peninsular region, which complemented what was then

\textsuperscript{402} Kalpagam 1995. 87-98.
\textsuperscript{403} Rennell 1976. 'Preface to the First Edition'. ix.
known of the shape and size of the Mughal empire in the north. Thus, for the first time, India could be viewed as a whole from four detached sheets.

The Memoir also carried 'sketches' of the history of the Mughal empire and the Mahrattas, the narrative of the former to indicate the possibility of a similar British empire, and the latter narrative was to describe the formidable foe who needed to be vanquished. India was not envisioned as a fixed entity since the days of Alexander. The turbulence of history had made it into a malleable entity and the purpose of selectively reconstructed narratives of history was meant to impress the idea of the non-fixity of political spaces within a geographically united space. Rennell notes:

I shall not attempt to trace the various fluctuations of boundary that took place in this empire... It is sufficient for my purpose that I have already impressed on the mind of the reader, an idea that the provinces of Hindoostan proper have seldom continued under one head, during a period of 20 successive years from the earliest history, down to the reign of Akbar in the 16th Century, [...], and that sometimes the empire of Delhi was confined within the proper limits of the province of that name. (Rennell, 788)

Rennell also established the fashion of writing a memoir alongside the construction of the map. As pointed out before, geographical memoirs were produced by geographers in order to legitimize their intellectual pretensions. By the late eighteenth century, these memoirs had become regular features accompanying a geographer's major work. They formed the trademark of geographers who were often supported and patronized by the state or those who had claims to social status. The purpose of the memoirs was to explain the process of collecting and collating their data, crucial for validating the objectivity of the map, thus certifying its claims to factuality and certainty. Rennell was once accused of being "adept" in an "occult" science in his maps of western Africa, for failing to provide a document about how he teased geographical knowledge from a mass of conflicting data. His Memoir of the Map of Hindoostan was the outcome of the lesson learnt from that mistake.

Rennell's map, thus was a conceptual unifier of geographical knowledge. It was eclectic, gathering as much information from indigenous sources as from European. Apart from the Ain-i-Akbari which gave a fair idea of the reaches and extent of the Mughal empire, he made use of several maps drawn by Indians. He mentions four of these in his Memoir. The first was a large map of Punjab with the names in Persian. The roads in the north-west had not yet been surveyed and Rennell found the map particularly helpful for the
information the map offered about Lahore, Multan and Attock and the exact placing of the five rivers. He wrote in his Memoir:

I consider the MS as a valuable acquisition, for it not only conveys a distinct idea of the courses had before: but with the aid of Ayin Acbaree, sets us right as to the identity of the rivers crossed by Alexander. 405

Another map used by Rennell was by a 'native of Guzerat' which "gave the form of Guzerat with more accuracy than most of the European maps can boast". Rennell also mentioned a "Hindoo map of Bundela or Bundeland, including generally the tract between the Betwah and Soane rivers, and from the Ganges to the Nerbudda", with the names in Persian. The fourth map was a "Malabar map; or rather a map drawn by a native of the Carnatic ... the map alluded to, is not constructed, by a scale, but rudely sketched out without much proportion being observed either in the bearings or distances of places, from each other: and the names, and the distances between the stages; are written in the Malabar language". What is striking in Rennell's statements is his complete erasure of authorship of native maps. It is the European master who is to judge the worth of these maps in order to assimilate these small parts into his immense project. It was the task of compilation, of reconciling different geographical sources and combining various surveys was the high art of the 18th Century. Though indigenous sources were vital to the British surveys these were barely mentioned and subordinated beneath a "visual and graphic rhetoric of cartographic knowledge". 406 They all fed into the grand design of a "single cartographic archive" where information and materials were standardized.

It was a means and metaphor for a reordering of space according to imperialist designs. Finally, his map might have had all claims to having expunged emotive and mythic elements from the map's spatial imagery, but these popular elements continued in the historical narratives of the elaborate cartouches. The symbolic content of the title cartouche in Rennell's Map of Hindoostan has been dealt with in detail by Matthew Edney and Sudipta Sen. The depiction of the brahmin handing over the Hindoo Shastras to Britannia overtly refers to not only a military and geographical conquest, but also the conquest of the native cultural and epistemological space, making the British the intellectual masters of the native landscape.

405 Rennell 1976. 212.
What Rennell only initiated, later British cartographers completed. The colonial project of governance entailed first defining the territory and fixing the boundary, before an understanding of the realm contained therein in terms of people and things. Later surveys like the Great Trigonometrical Survey initiated by William Lambton in the early nineteenth century and topographic surveys of Colin Mackenzie served to stabilize the space politically and geographically.

"A desideratum still more sublime"

The story of Lambton's cartographic pursuit in India encode different perspectives on the territorial, political and conceptual struggles attendant on the emergence of the colony. His cartographic fantasy removed land from a pre-existing social sphere placing it firmly in a constructed universal scheme. The cartographic synthesis thus encoded the familiar in an unfamiliar language converting the local and the regional into a meta framework of the scientific universal coordinates, effacing the deep links between people and their lived space.

Lambton himself regarded the general survey and the general map as a very important part of his labours, though geodesy was "the higher branch" which remained entirely in his hands. The objective was to make higher science serve the utilitarian purpose of colonialism. "I shall offer this plan as a specimen", he writes in his memoir, "of what the higher branches of my survey may be applied to, and how far practical science may be combined with publick utility, and it will be gratifying to me, after having extended my operations from Cape Comorin to the banks of the Kistna, to see them become the foundation of various useful works. [...] I shall feel peculiar satisfaction if, while my labours are directed to the advancement of of science in general, they may at the same time contribute to the more immediate benefit of my country".

Early in Dec 1799, whilst Mackenzie was making preparations for his topographical survey of Mysore, Lambton put forward his first proposal for a trigonometrical survey to fix prominent points over the whole south peninsula. Writing about the singularity and efficacy of his proposed idea, he writes in the Asiatic Research:

Having long reflected on the great advantage to general Geography that would be derived from extending a survey across the Peninsula of India for ... determining the positions of the principal geographical points; and seeing that by the success of the

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British arms ... country is acquired ... which not only opens a free communication with the Malabar Coast, but ... affords a more admirable means of connecting that with the Coast of Coromandel by an uninterrupted series of triangles, and of continuing that series to an almost unlimited extent in every other direction; ...

It is scarcely necessary to say what the advantage will be of ascertaining the great geographical features ... upon correct mathematical principles; for then, after surveys of different districts have been made in the usual mode, they can be combined into one general Map. 408

Lambton stressed to the government the practical benefits which would emanate from his geodetic survey. According to him, it would provide a veritable extendable lattice into which results from more detailed but less accurate local or regional surveys could be incorporated.

In 1781, Lambton was appointed ensign in Lord Fauconberg's foot, a provincial or home service regiment in Britain. In 1782 he transferred with the rank of ensign to the 33rd regiment with which he stayed on for a long while. He was initially deputed to North America and then Canada to join the regiment. He was here appointed both by the War Office as well as the Board of Ordnance. 409 He read deeply while stationed in America, taking a special interest in geodesy and following closely the work of General Roy and of the Ordnance Survey of Great Britain. When in 1796, the 33rd regiment was ordered to the East Indies, Lambton was obliged to choose between his civil and military positions. He chose to go to India with his regiment, which was then commanded by Arthur Wellesley, later Wellesley. Lambton arrived in Bengal with his regiment in 1797. He later moved to Madras in the September of 1798. Through a letter of introduction from his Canadian patron, Brooke Watson, to Sir Alured Clark, commander-in-chief in India, he soon secured the staff position of brigade major to the king's troops under Fort St. George in 1799. It was during this time that he actively wrote papers for the Asiatic Researches dabbling with various scientific and mathematical issues. 410 These fetched attention from Wellesley, who proved to be a helpful patron for Lambton's later endeavours in India. Lambton sprung into prominence during the expedition against Seringapatam in the fourth Anglo-Mysore War against Tipu Sultan. The war was supposedly saved by Lambton's apt intervention in

409 During the period Lambton was surveying in New Brunswick, a mountain was named Lambton's Mountain after or by him. The name appears on some early maps. The peak was later known as Big Bald Mountain.
410 Lambton's ' Theory of Walls' and ' Maximum of mechanical power and the effects of machines in motion' were the two papers communicated to the Asiatic Society.
pointing out the correct direction by the location of stars when General Baird was leading his army at night towards the enemy camp rather than to safety.

It was in 1799 that Lambton presented a memorial to the governor of Madras proposing a trigonometric survey connecting the Malabar and Coromandel coasts. With a seconding of the proposal by both Mackenzie and Wellesley, and after a sanction by Close from Bangalore, on 6th of February, 1800 formal orders were issued for the start of the survey. The instruments were purchased from Dr. Dinwiddie in Calcutta, where Lambton had initially seen them. Lambton’s instruments were a theodolite, a zenith sector and steel chains.\textsuperscript{411} In this, his demands for instruments were modelled on those used by William Roy. He was given further detailed orders by Webbe to orient his survey with Mackenzie’s topographical survey which had also commenced in the peninsula:

You have been already made acquainted with the intention ... to employ you in an Astronomical Survey in the Peninsula but chiefly in the territories lately subdued ...

A considerable establishment under the direction of Capt. Mackenzie having already commenced a detailed Survey of the provinces of Mysoor and the Southern part of the Peninsula, his Lordship is desirous that, without departing from the purposes of general geography which your labours will have principally in view, they may ... be made to coincide with those of Capt. Mackenzie, so as to enable him with greater facility to combine the details of his Survey, and to verify the positions of the most remarkable Stations ... \textsuperscript{412}

He was thereupon asked to submit the full details of his proposal.

The essential features of Lambton’s proposals were that his survey would be based on “correct mathematical principles”, that it would extend right across the Peninsula, that it would be capable of extension in every direction, and that it would be a reliable basis for all other surveys, “that this survey should precede all others, that data may be readily prepared, and the work become the legitimate foundation of every other survey, whether geographical, military or statistical”.\textsuperscript{413} However, it had an added geodetic goal. His closing words in his memoir of 1801, expresses an objective to “accomplish a desideratum still more sublime, \textsuperscript{411} The theodolite used by Lambton has a story of its own. It was modelled on the theodolite constructed by Ramsden and used by Roy. The three foot theodolite, by William Cary, once apprenticed to Jesse Ramsden, was captured on the passage to India by the French frigate and landed at Mauritius, but it was ultimately returned to its destination by a chivalric French governor Caen with a complimentary letter to the governor of Madras. The chain was modelled on the one used by Roy. The zenith sector was of 5 feet radius and was constructed by Ramsden. The chain was meant as a present for the emperor of China from Lord Macartney’s embassy but was declined. It was ultimately handed over to Mr. Dinwiddie, the astronomer to the mission, as part payment for his services. See Markham 1878. 60-61.
\textsuperscript{412} From Phillimore 1950. 234.
\textsuperscript{413} Lambton, William in a letter dated 28th. January, 1811. From Ibid. 233.
viz, to determine by actual measurement the magnitude and figure of the earth, an object of the utmost importance in the higher branches of mechanics and physical astronomy.” It was this scientific end which finally secured approval for Lambton’s scheme. In his Plan of the survey, he discusses in detail the special features of his proposed work and the precautions needed to ensure correct mathematical principles:

It has been the usual practice ... to work upon a series of plane triangles, ... thinking the curvature of the Earth of too little consequence to be taken into consideration; and the only mode of correcting was by observing Jupiter’s satellites, occultation of stars etc., for determining the longitude. ... It is easy to see the errors that must result from extending the survey over a portion of the globe comprehending a number of degrees both in Latitude and Longitude. ... the first operation for obtaining a datum ... is by the measurement of a base line, which being reduced to the level becomes a part of a great circle on the surface of the Earth. ... From thence is derived new data to proceed in all directions, recollecting that ... the observed ... angle is to be corrected again to the angle made by the chords.

Copies of Lambton’s Plan and of Mackenzie’s Plan of the Mysore Survey were passed to Rennell who had by then returned back to London. However, Rennell completely misunderstood Lambton’s proposals. As Phillimore assumes, he might have been baffled by the Government order appointing Lambton in charge of an “Astronomical Survey”, and that for Mackenzie’s survey of Mysore “principal points ought ... to be corrected by Astronomical observations connected by a series of triangles”. Rennell presumed that whilst Mackenzie carried out a topographical survey of Mysore, Lambton was to conduct a completely independent series of astronomical observations, on which Mackenzie’s survey would be subsequently adjusted. This misconception compelled him to express contempt towards the proposals as “one of the most extraordinary that has been heard of”. As for accuracy, Rennell opined that his own method of deriving maps from route surveys was scientifically sound. Copies of his letters of protest were sent both to Lambton and Mackenzie. Lambton, much disturbed by Rennell’s objections, wrote down a detailed refutation, which ultimately forced Rennell to withdraw his protest. Nevil Maskelyne, the Geographer Royal and uncle to Edward Clive, the governor of Madras, being persuaded by Clive, too took Lambton’s side. His intervention ultimately broke the deadlock and the misunderstanding between the two cartographers belonging to two generations.

414 From Ibid. 250.
415 Asiatic Research VII, 1801. 318. From Ibid. 250.
**Trigonometrical Survey of India**

The term 'Astronomical Survey' was often used by the Government in its documents, while Lambton himself generally described himself as being "on Geographical Survey", or "on General Survey" right up to 1815. The expression 'Trigonometrical Survey' appears on Lambton's charts and memoirs:

> The trigonometrical part of this survey is the foundation from which all distances and situations of places are deduced; a true delineation of the river vallies, ranges of mountains, with some noted points near the ghauts and passes, will also be a foundation for more minute topographical surveys such as are immediately wanted for military purposes.416

Lambton's survey proposals were approved on 6th February, 1800 and began between 1800-1802 with the preliminary survey of Mysore and the measurement of the base line at St. Thomas' Mount in Madras in 1802.

The Observatory in Madras, where observations and records stretched back many decades and where the dependable measurements could be taken, was the starting point of the sequence of peninsular surveys. Its value in relation to the Greenwich meridian, the zero degree longitude and the Equator, the zero degree latitude was the sheet anchor to Lambton's survey. Madras was the Indian counterpart of Greenwich.417 As Markham commented:

> The longitude of Madras is important as that of the secondary meridian, or substitute for the prime meridian of Greenwich Observatory, from which observations for longitude in the Indian Survey are reckoned. Every station and place in that Survey will be erroneous if the longitude of Madras is in error. In other words, the accuracy with which the entire map of India, as a whole will be placed on a globe, will correspond precisely to the accuracy with which the geographical position of the Madras observatory has been determined.418

It was a crucial means to translate and rearrange the geographical space in relation to English coordinates. Observations from this point had been taken from 1787, but the building of the Madras Observatory was erected in 1792. Goldingham, who had succeeded Michael Topping, was the astronomer at the Observatory as Lambton's contemporary.

416 From Ibid. 237.
417 Keay 2000. 70.
418 Markham 1878. 65.
The Trigonometrical Survey inaugurated itself with the measurement of a base line near Madras. The next leg of the survey was the measurement of the arc of meridian. His programme was to measure an arc of more than three degrees in length astride meridian 78°, which was to stretch from Cape Comorin to the Himalayas. The measurement of the meridional arc was crucial in view of Lambton's geodesic pursuit. Maskelyne, wrote after discussions with Rennell in 1806:

Among the subjects which are purely scientific, the measurement of an extensive arc on the meridian will doubtless (attract) the first attention, being ... grand desideratum to compare with what is doing in England and France, and with what was recently been done at the polar circle.\(^{419}\)

The arc was a device to conjoin and combine disparate experiments and measurements at different regions and then spatially unite them. The regions colonised by European nations used them as extensions of their laboratory spaces originally located in the home country. As triangles formed parts of an imagined whole (i.e. the earth, which then would be reduced from infinite to finite), similarly, the arc would gradually progress till it encircled the entire earth reducing it to a comprehensible and manageable structure. The arc and triangulation enforced the idea of a continuum which was an useful mechanism of expanding "invasive prospects".\(^{420}\) Once the Arc Series was completed from Cape Comorin to Bangalore, in 1811, Lambton and his team turned their attention to extend northwards to the Himalayas.

The site chosen was a stretch of level ground between St Thomas' Mount and another hill seven and a half miles to the south. A series of triangles, in two degrees of latitude was then carried across the peninsula. The distance across the peninsula, at this point, was found to be 360 miles, while the best maps till date had given the distance as 400 miles. Thus the absolute need for a Trigonometrical survey based on scientific precision in contrast to other methods was justified. The report on his meridional arc in the Carnatic was submitted in October 1803, one copy being passed to the Asiatic Society at Calcutta, and published in the *Asiatic Researches* VIII. This report forms the first volume of the manuscript reports of the Trigonometrical Survey, the second part, covering operations across the peninsula, 1803-6 was submitted in 1807. The *General Map of the South Peninsula* was submitted in 1810 along with a memoir.

\(^{419}\) From Phillimore 1950. 265.  
\(^{420}\) The phrase is borrowed from Sen 2002. 57.
Lambton became captain in the 33rd foot in 1806 and became a Major in 1808. Though the 33rd foot returned to England from Madras in 1811, Lambton stayed back as superintendent of the Indian survey at the company's expense. In 1818, his survey was transferred from Madras to be under the control of the supreme government under Fort William. It was now that the survey received the name with which it would be recognised henceforth. It was named the Great or Great Trigonometrical Survey or GTS of India. His importance therefore surpassed that of Mackenzie who was Surveyor General of India. With Lambton's survey being officially transferred, he was directly answerable only to the government and not Mackenzie under whose authority all survey activities in all the three presidencies so long fell.421

In 1818, once his third report was complete, he proposed extending his arc further north. Agra was fixed as a suitable point by the government. He initiated moving his headquarters from Hyderabad to Nagpur, but died before the transfer was complete. Lambton's arc was 10° or 700 miles at the time of his death. It was already longer than the European arc and much admired as a scientific triumph in the European world. It was left to Everest ultimately to complete Lambton's scheme.

After Lambton's death in 1823, the Trigonometrical Survey was carried forward by George Everest, who was previously Lambton's subaltern. He succeeded in measuring the length of the meridional arc, from southern India to Dehra Dun in the North.

Mixed appraisal of the survey

Lambton's enterprise had met with considerable criticism towards the beginning, though consequently his feats won him membership in the French Academy and fellowship of the Royal Society as well as the Asiatic Society. It was of course essential for him to write his memoir to demonstrate the value of his experiments. Though Rennell was appeased by Maskelyne's interventions and Lambton's refutations, there were several more criticisms to his work and the amount spent on the activity. The members of the Finance Committee of Madras “appear to have had great difficulty in comprehending the object of Col. Lambton's survey”. One of the Committee's leading members having voiced the criticisms reflects the general idea that the survey was an entire waste of resources and time:

421 Baigent 2009.

242
If any traveller wished to proceed to Seringapatam, need only say to head palankeen bearer, and he vouched, that he would find his way to that place without having recourse to Col. Lambton’s map.422

The Committee plagued Lambton with numerous questions and comments. Lambton was forced to react passionately. Lord Bentinck requested Lambton to resist representing his feelings in public correspondence. The Survey was almost at the verge of being called off.

On the other hand, there were also people who supported the survey from its very start. The then Quartermaster General Lt. Col. John Munro, on having heard that the Government contemplated the abolition of the Survey, waited on the Governor for the purpose of representing the utility of the operations in a military point of view. He argued that the Topographical Survey, which was crucial in ascertaining British territory and strategizing defence, was itself dependent on the Trigonometrical Survey and its triangulation for its accuracy. On his assertion that the Survey was under the discretion of the Military Institution, and that it was ultimately its work, that the intention to abandon the survey was finally annihilated.

Much support was garnered in the name of science and scientific achievement especially taken up as a matter of national pride. William Petrie, who acted as Governor after Bentinck’s departure, and who was also an amateur astronomer remarked:

I have repeatedly submitted to the Hon’ble Company my sentiments of this splendid work. Its merits ... require no proofs of my testimony, and when the Fame of the Conquest and Extensive Dominion has passed away, a page may remain on the records of Science to shew that under the fostering and liberal protection of the East India Company, a Survey has been carried on in a part of their Eastern Empire, verified and determined by a Series of Astronomical and Mathematical Measures, not inferior in Science and Accuracy to the Brilliant Labors of the English and Fresh Astronomers.

The value of Major Lambton’s work has been justly appreciated, not only by Mathematicians in our own Country, but by that Dept. there can be no national warfare.423

Another of Lambton’s supporters was Scott of the Madras Civil Services. He was the first judge in the Court of Appeal. He was a known scholar of science and was generally consulted by the Madras Government on various issues pertaining to science. Scott, too in the same vein as Petrie, talks of Lambton’s achievements as pride to the nation:

423 From Ibid. 265.
The ... very great importance of Major Lambton's Survey, is ... but little understood. I fear there are but few among us who consider the ascertaining the lengths of three or four degrees of the meridian, and as many of Longitudes, as of any importance or who conceive that much scientific knowledge, or much labour, is necessary for accomplishing it.

He is full of reproach for the unenterprising British nation as against the French which according to him, achieved enormous feats in science. Lambton's contribution to science, if allowed to continue, would surmount and supersede these other scientifically advanced European nations:

The opinions of the Learned in Europe however, are very different; witness the expensive expeditions sent by the French to the Polar Circle and Equator ... Major Lambton will, if not prematurely interrupted, in a short time have ascertained the length of a greater arc of the Meridian than was done either in Lapland or Peru ...

Combative nationalism supported and embraced the cause of science to assert greatness. In India, French power, though by now nearly disappearing, was in fact the reason behind major wars which saw the primary consolidation of the Company estate both in Bengal and Seringapatam. The contours of the Company's territory needed to be redrawn also to assert increasing British authority as against the French receding one. Scott further pleads for Lambton's endeavours both in the name of a greater pursuit of scientific knowledge as also practical purposes of administration:

It is only by having the correct length of degrees of the Meridian and Longitude in different Latitudes that the great desideratum can be obtained, of establishing what the true figure of the Earth ... really is; some may consider this a matter of mere curiosity, without considering its real importance in Navigation, Geography, and Astronomy, and, where France has done so much and they are still going on in England, do not let us be so stupidly ignorant as not to set a proper value on what Major Lambton is doing.  

Overwriting lived space

The specular method of the survey completely overwrote as well as overrode the lived space which already existed in the experiential reality of the natives. Lambton and his men were moving over the full extent of the peninsula, from one province to another, as though in a sweeping glance. They had no chance of ground level interaction with either the colonial officials posted at various places or the resident natives. Pre-existing provincial boundaries did not matter, so did not cultural, religious or linguistic divides. The spectacle

424 From Ibid. 265.
of the surveyor on field work parading his measuring apparatus, performing his measurements surrounded by suspicious natives had a distinct air of theatricality about it. The mobility of the survey team assumed, as it were, an appurtenance of property, a right of way which came incidentally with the possession of property. Their only concern was the ready access to vantage points, such as mountain or hill tops, or temple and fort steeplles. The outlook is instrumental in discursively constructing a gaze, an authoritative viewpoint. The entire activity was based on this construction of the gaze which proclaimed a mastery of space. Space, thus fixed, was mathematically proscribed by the central observer as Michel de Certeau writes of the Cartesian system’s positioning of the observer/surveyor:

A Cartesian attitude ... is an effort to delimit one’s own place in a world bewitched by the invisible powers of the Other ... It is also a mastery of places through sight. The division of space makes possible a panoptic practice proceeding from a place whence the eye can transform foreign forces into objects that can be observed and measured, and thus control and ‘include’ them within its scope of vision. 425

The search for elevated viewpoint (which marked other modes of spatial representation like the landscape prospects or panorama paintings) is itself loaded with imperial rhetoric and symbolism which sought to format the earth’s surface into a system of spatial hierarchy of differential geographies of that of the colonial core and periphery. Figuratively, height takes over as a way in which value is attributed. The vertical height stands for the imagined ‘chain of being’: the European and especially the British being stationed higher than other spaces in the world. To quote Certeau once again in explaining the construction of the point of view of the colonial surveyor:

His elevation transforms him into a voyeur. It puts him at a distance. It transforms the bewitching world by which one was ‘possessed’ into a text that lies before one’s eyes. It allows one to read it, to be Solar Eye, looking down like a God. The exaltation of a scopic and gnostic drive; the fiction of knowledge is related to this lust to be a viewpoint and nothing more. 425

However, the occupation of elevated vantage points in the localities surveyed often had its share of problems and conflicts, but Lambton remained unsubdued by them. One of the officers involved in the Trigonometrical Survey, Warren wrote to the Collector in Chittoor in 1803 about the outrage his activities created among the local Poligars when the Namicul Droog was taken as a station for triangulation:

425 Certeau 1984. 36.
426 Ibid. 36.
Neither myself, nor the delegate which you sent me, were aware of any Poligar retaining still any authority, Civil or Military, in your Districts and, ... Narnicul Droog being one of my points, without any further ceremony, I directed one of my flags to be placed on that hill and the morning followed, intending to observe at the station.

No obstacles was offered me as I entered the bound hedge and Jungle which surrounds the Fort, but I noticed a number of men hurrying from the village ... with matchlocks, swords, and daggers, who entering the jungle at various places met ... and opposed with great clamour my proceeding any further. I thought at first that they only wanted to see my passport, or that they questioned how far I was authorised by you to visit the Fort of Narnicul Droog, but in this I was mistaken; they answered to all that I urged that I had no business there without the Poligar's leave, and that I must return to the village ... until it was obtained, and meanwhile that I would meet with due attention there.

As it would have been vain to resist, I directed my bearers to return, and resolved on acquainting you with what had happened ...

To this, the collector replied:

Had I been aware of your intention to observe from Narnicul Droog I could have you of the reception you were likely to experience from the Poligar there, who has been for some months back in a state of disobedience and refractoriness. ... I therefore think it would be improper to hazard an opportunity for the repetition of similar insult by insisting on accomplishing the object of your public functions in Naracul Polliam, and that it would be preferable to desist from that attempt.427

This was not the last time that Warren would face such a situation. Shortly after, Warren met with similar treatment at another hill in the same area. Here is what he writes about it in his letter:

Having had occasion to send a Flag to be placed on Bungarry Droog Hill near Munglee, I gave directions to my Lascars to that effect and, as you are so good as to assist me with a letter to the Poligar of that place, ... I concluded ... that no possible objection could be made to its admission. To my no small surprise, however, the people I sent ... informed me that ... they were stopped by some Tanna Peons, who signified to them that they could not pass without the Poligar's leave. On this my Lascar delivered your letter which was conveyed to him by one of his own people. The Poligar returned for answer that he could not allow the Flag to be placed in the Droog, by the reason that as it commanded a view of his habitation his women might be exposed to view.428

427 Letters of September 25th and 27th, 1803; MPC 14-10-03. From Phillimore 1950. 369.
428 From Ibid. 369.
Wishing to avoid an unpleasant interface, Warren directed his men to another adjacent hill, which would serve his purpose. He asked his 'lascars' to plant the flag on the other hill. However, to Warren's dismay, the same objection was raised for this hill as well "on account of its commanding a view of the Pettah". Instead, the Poligar's men pointed out a "small hill" in the plain at some distance, and said that the surveyors could place their flag on that if they want. Since Warren needed to place the flag on highest of hills, and "preceding and succeeding points" this was hardly a solution. His every move frustrated, he writes to the Collector about his desperation: "These in a hilly tract like this are generally the highest, and almost everywhere the stronghold of a Poligar". The Collector suggested that the team abstain from further survey in the Chittoor Polliams for the time being and Lambton was forced to inform the Government that he had abandoned the attempt to carry triangles through Chittoor.

Few years later, Lambton faced other incidents of native intolerance in north-west Mysore. This time it was towards a British officer, De Penning, for having cut down a peepul tree in order to clear and create the view. The case was sent to the Resident and then to the Government, but Lambton took offence to the Government's sending an officer "as far as Shikarpur" to make an enquiry into the incident when he had stated that De Penning was not at fault.429 Lambton failed to realize why his survey faced such obstacles and blamed it partly on British administrative inefficiency and failure to communicate with the natives. In reply to a letter from the Government, Lambton replied:

With respect to placing flags upon pagodas, mounds in forts, etc, I have only to say that when I crossed the Peninsula in 1804-5, there was scarcely a pagoda or Droog in the Mysoor country that was not a station, and I never met with the smallest objection to placing flags, either one or the other.

Even in the bigotted country of Tanjore, I ascended no less than 12 Coverams [gopuram], and without those lofty buildings I never could have got through the country. At Ramisseram [Rameshwaram] I was permitted to place the Instrument directly over the cell which contained the Sawmy, and all that too when there was a general apprehension of the Christian Religion being propagated.430

That Lambton could a few years back station himself atop Gopurams and temple peaks, was, according to him, a sign of able governance of the British. The complete

429 Government later stated that the complaints against De Penning "were much exaggerated, but his conduct in striking the public servants at Chundergooty is considered to be highly reprehensible". See Ibid. 372.

430 Dn.63 (337), 18-12-4. From Ibid. 372.
indifference and unawareness of sacred spaces of the natives is flaunted in the name of the rational operation. In fact, those sacred spaces were transformed into ratified spaces of British power and surveillance from which science could be implemented. Before extending his triangulation to the Nizam's province southward, Lambton implored the local officials and the resident Henry Russell to make sure there was cooperation by the natives:

In order to state to you my particular objects and wants, that you may give full explanation to His Highness the Nizam, or the different Vakeels residing at his Court; for unless there be a readiness everywhere to aid and accommodate, it will be impossible for me to carry on a work of this nature, especially if any obstacles be thrown in my way.

I am aware of the jealousy of all the native powers, as well as that of their subordinate chiefs, on seeing any description of survey carried on within their districts; but, mine being of a more general and extensive nature than those which they have been accustomed to notice, and not embracing statistical objects, or such as excite their suspicion, I am in hopes that by a little address they may be induced to view it without alarm. 431

It is clear that the surveyor is generally deemed an outsider by the local inhabitants and is seen as socially disruptive force. It is ironic that the Survey which was supposed to usher in science and rationality, actually alienated the natives further more and kept them away from the results. In fact there are instances whereby the surveyor is often perceived by the natives in terms quite contrary to rational behaviour. In an anecdote in his travelogue, W.H. Sleeman noted that in Central India Everest's practice of surveying at night, when the atmosphere was clear, led "the peasantry to believe that men who were required to do their work by the aid of fires lighted in the dead of night upon high places, and work which none but themselves could comprehend, must hold communion with supernatural beings ..." 432

On the other hand, nothing like Rennell's matter of fact acknowledgment of native sources ever figure in any of Lambton's survey records. The advent of such mathematical employment and geodetic geometry as that of Lambton's, marks a point of departure from the earlier methods which relied heavily on local knowledge. Lambton's Trigonometric Survey is indicative of a process that removed land from its location in popular memory and upset the tradition of a limited localized setting, where space was lived and experienced. By this means a completely 'unruly' social space that existed was underwritten by a scheme of self-empowerment which was most closely associated with the visualising of space through

431 Ddn. 146 (3), 1-3-13. From Ibid. 372.
elaborate, geometry-based survey instruments. Such conceptualisation of space produced by
the mechanical eye, the theodolite is the “dominated – and hence passively experienced –
space which the imagination seeks to change and appropriate”. It subjected cultural and
geographic variety of an extensive region to the levelling and flattening sameness of the
mathematical order, and from this ground plan constructed the globe. It is as Harvey puts
it:

The application of mathematical principles produces 'a formal ensemble of abstract
places' and 'collates on the same plane heterogeneous places, some received from
tradition and others produced by observation'. The map is, in effect, a homogenization
and eification of the rich diversity of spatial itineraries and spatial stories. It 'eliminates
little by little' all traces of 'the practices that produce it'.

Naturalized frontiers: spaces of knowledge

According to Certeau, the “establishment of a break between a place appropriated as
one's own and its other” entails a number of processes. Among these is the “ability to
transform the uncertainties of history into readable spaces” which is legitimized by “power
of knowledge”. An autonomous space is the product of knowledge which in turn dependent
on a “certain power (which) is the precondition of this knowledge and not merely its effect
or its attribute ... It produces itself in and through this knowledge”.

The concept of boundary or frontier is one of the most essential as well as the most
interesting with respect to construction of space. As land came to be redefined as territory or
area, it automatically entailed a boundary to make it a mensurable entity with fixed shape
and bounds. According to Sudipta Sen:

The mapping of India permitted a certain play of visual imagination that belied the
episodic nature of the Indian conquest and the indefinite frontiers of the new state. In
this sense it was an indispensable exercise of authority, re-ordering the country on
paper.

The cartographic methods and ontology subscribed to by the surveyors presupposed India as
a geographical expression with natural boundaries. Notions of protective and natural
boundaries surrounding India were taken as axiomatic. The East India Company's

433 Lefebvre 1991. 41.
435 Harvey 1989a. 252-253.
436 Certeau 1984. 36.
acquisition of territory and simultaneously the movement of the survey, up the Gangetic plains to Punjab, and then to the mountain ranges beyond the Indus, and in the north-east, towards Tibet and Burma, can be seen as a search for a permanent and viable frontier. India could be conceived of as a geographical entity only when its bounds were defined, and only when the boundaries thought natural were secure enough. Colonial cartography “with one stroke of the pen disabled medieval notions of a fractured, incomplete India”. Ian J. Barrow, in the context of the idea of colonial frontiers points out the imperialist perception of land which sought to transform space into a place. Under these circumstances land was understood only as area:

If land came to be thought of primarily as area, capable of being mathematically compared, boundaries may then be considered ‘natural’ since an area must logically have its parameters if it is to constitute a place.438

The construction of the boundary of India, according to Barrow, was the outcome of three phases of British cartography in India. It is interesting to see how what was generally known as the North-West Frontier continually shifted further west and northwards over the two centuries of British rule in India. During Rennell’s era of cartography in late eighteenth century, frontiers were largely undelimited. The route survey served as a penetrative tool and as a facilitator to expansion beyond a frontier. The trigonometric survey of the first half of the nineteenth century, the base line was extended through a frontier and information regarding the interior locations was scientifically obtained and consolidated. The latter half of the nineteenth century and the first two decades of the twentieth century, the cartographers’ bureaucracy, the Survey of India and the Boundary Commission were established which discursively settled the notions of protective and natural boundaries surrounding India. According to Edney too, the logic behind the colonial expansion was the securing of safe and stable frontiers. According to Edney:

Whatever the opinion of the Directors and politicians in London, the Company expanded in India almost by necessity; territorial growth was the imperial equivalent of commercial expansion dictated by the political economies of the day. Few, if any administrators, argued that a state was an organism that must grow to survive, but all understood the logic, if not the need, to subdue the peripheral areas so that the core domains might be made more secure.439

In this regard, as Clements Markham puts it:

439 Edney 1990. 394.
The structure of the great Himalayan mass which bounds India to the north is the branch of the subject to which attention is naturally drawn in the first place, and it is that to which both travellers and systematic geographers have devoted the largest share of their labours.\textsuperscript{440}

Also, as Barrow has pointed out, there was a linear conception of space: that further one went inland from the shores, the more impenetrable the landscape became and the more uncivilized the inhabitants.\textsuperscript{441} Therefore, the reports of a long line of travellers preceded any attempt to map it. Markham talks of early European travellers such as the Missionaries Desideri, Freyre and Antonio di Andrada who were simply appalled by the snowy mass and the eternal winter. The Himalayas drew the attention of the British as a natural barrier of the plains they colonized, which was watered by the rivers which had their source hidden somewhere in the snowy ranges. Also, the actual height of the peaks were a mystery and the desire to ascertain their height was an overwhelming desire. At the first glance, there seemed to be nothing to lend a clue to the development of the mountain masses, and there appeared an assemblage of elevated peaks confusedly heaped together. A profusion of geographical narratives thus sprung out of the need to subject these great ranges to analysis (a few of which have been discussed in chapter 6). It was Capt. Herbert, one of the first British officers to explore the Himalayan region, who first came up with the idea that, by tracing the courses of the rivers and their tributary streams, a clue would be found to lead an observer out of this labyrinth. Following his theory there were a number of expeditions which ramified into various directions subjecting this lofty highlands to rigorous topographical, geological and botanical mapping. It was also generally believed that the resolution of the mystery of the Himalayas would unfold numerous unanswered questions about the plains and of physical geography in general too.

The rivers flowing from the Himalayas and forming the two great systems of the Indus and Ganges, which were deemed to be the nerve centre of the Indian civilization were studied with minute attention. The physical laws regulating the direction, oscillation and volume of the rivers were explored by Fergusson who also studied the Gangetic deltas. His extensive diorama of the Ganges has already been talked about in Chapter 4. Fergusson, through his study points out an important hydrographic law, namely, that the mouths of tributaries shift upwards along the main stream in consequence of the decrease of slope

\textsuperscript{440} Markham 1871. 247.  
\textsuperscript{441} Barrow 2005. n.p.
caused by the rise of the delta, which causes the tributaries to increase the angle at which they fall into the Ganges.

The frontier, therefore, as Barrow has mentioned, was the "metaphor for knowledge ... an area to be reached and eventually traversed, but a zone, nevertheless, demarcating what was and was not known". It determined the extent of known territory.

**Marine cartography and the mobile eye**

Where on the north, the Himalayas proved to be a formidable barrier, especially against an impending threat of Russian invasion later on in the nineteenth century, the sea in the south was deemed an equally invincible natural barrier. In fact, as sea faring traders, with the British in India, marine cartography preceded any survey on land.

From early times, armed vessels were employed at Bombay to protect the Company's ships from the pirates. It was as the Bombay Marine that the British consolidated their naval forces from 1742 onwards. Later on the same would be renamed the Indian Navy and existed from 1832 to 1862. Though there was opportunity to train surveyors here, it was not until the days of Rennell and Dalrymple that marine surveys received its fair share of encouragement. John Ritchie, who was Hydrographical Surveyor from 1770 to 1785, surveyed the coasts of Bay of Bengal and the outlets of the Ganges. Many of his sea charts were engraved by Dalrymple and were used by Rennell extensively as his material for the survey of Bengal. In the late eighteenth century, a number of ships like the *Endeavour*, and the *Panther*, surveyed the west coast from Daman and Diu to Cape Comorin. Some of these charts too were engraved by Dalrymple. Another of the East India Company's packets *Antelope* sailed from Macao, but was wrecked near the Pelew Islands. All these ships were captained by McCluer, who surveyed coasts of West Indies and other Caribbean Islands too.

The physical world, in this case, is the result of the spectation of the observer moving through space, in this case the sea. Space thus constructed was the outcome of the mobile eye and therefore had to employ fit apparatus for stabilising it.

Daniel Ross, who was called the 'Father of the Indian Surveys', was the one to introduce a scientific accuracy to marine surveys through triangulation. He measured bases on shore by running a ten foot rod along a cord stretched tight between the extreme points, and kept in position by stakes, the direction being verified by a telescope. Exactly in the manner as the British waters were surveyed, when work on shore was impracticable, recourse was taken to measurement by sound. The vessels were anchored when the weather
was calm, and the time was taken between the flash and report of the gun, on assumption
that sound travels 1140 feet per second. Angles were taken with the help of a sextant, and
the triangulation was verified by frequent astronomical observation.\footnote{Markham 1871. 11.}

Many of the surveys of islands adjacent to the Indian peninsula were surveyed on
boats fully manned and armed in apprehension of outbreak from the native inhabitants who
were thought to be savage. Before taking observations on shore it was generally necessary
to station outposts in the jungles to prevent surprises. Most of these surveys were conducted
over a huge expanse of sea area often encompassing the entire sea route from England to the
Far East. Many of them were written in the manner of detailed topographical accounts and
were aimed to help navigation. Such hydrographic accounts were generally called Pilots and
a number of them were published in the nineteenth century like the \textit{West Coast of Hindostan
Pilot}, the \textit{Persian Gulf Pilot} and the \textit{Bay of Bengal Pilot}. For example, the \textit{Bay of Bengal
Pilot or the Sailing Directions for the Coasts of Ceylon, India and Siam, from Colombo to
Salang Island; Nicobar and Andaman Islands} was published by the Hydrographic
Department which contained not only instructions for navigation, but comprised of detailed
outline and description of the shore. It also contained translation charts of English nautical
terms and directions into several South Asian tongues like 'Hindustanee', 'Bengalee' and
'Malay', along with 'Hindoo Astronomical table', an Indian time table as well as a Bengalee
time table. The computation of time is usually against Madras time from the location of the
Madras Observatory. These usually charted distance according to the time required to reach
a specific point and frequently incorporated first person narratives. For example, the \textit{Bay of
Bengal Pilot} contained the remarks of Capt. Blanchard of the \textit{Riviere d' Abord}:

\begin{quote}
I sailed from Calcutta river for Reunion, ... the wind being tolerably strong from the
south-west and the sea rough. ... I experienced, without intermission, hard gales with
strong squalls from W.S.W. and S.W., which did not admit of my making the coast of
Orissa, but drove me over to the coast of Pegu.

I determined to pass to leeward of the Andamans, ... I passed half a mile northward of
the Little Coco, which at that end is quite steep; the bank of coral fringing the south and
west sides terminates near the north point and approaches nearer the coast. From that
point the dangers at the South end of Great Coco were visible to the eastward, though
the horizon was indistinct.\footnote{Imray 1879. 306-7.}
\end{quote}

The genre, though determined by the institutional strictures which ensured they
remain within specific tenets related to objectivity, yet, explorative epistemology was
ultimately dependent on the explorer/writer as the producer of truth. The construction of vision too is dependent entirely on the figure of the explorer (and his is the central voice which narrates it too). Most importantly, seeing here can be understood as a possessive force, a mode of appropriation. The "horizon (being) indistinct, space is thus shown as continuous and unified, and this integrity of space is confirmed by being arranged around the pivotal human subject. Space thus becomes a product of the human eye which bestows on it a sovereignty and implicates it into property ownership. 444

The marine survey was occasionally linked up with the survey on land by way of rivers, and thereby came about a complete circumscription of the Company's terrain. For example in the West, the hydrographic surveys of Pottinger and John Wood of the River Indus from the sea upwards were linked with Del Hoste and Alexander Burnes' survey of the area. 445 John Wood's work in the Indus area commenced in 1835. He accompanied Burnes afterwards in his mission to Kabul. Wood made a survey of the Indus from its mouth to Attock. At Kalabagh, where the Indus descended from the Salt Range, Wood found it difficult to move against the current. However, undeterred, Wood took the land route and reached Attock completing the survey amidst falls and rapids. After reaching Kabul with Burnes, he crossed the mountains to Kunduz. He is generally deemed the first European after Marco Polo to reach what was called the 'Bum-i-Dunya' or the roof of the world. 446 He received the prestigious gold medal from the Royal Geographical Society for this stupendous feat. In the future years, of course, there were many more such expeditions in the area which posed as an useful buffer between British India and Russia.

The surveys and the cartographic representations thus gave a political stability to a dynamic and volatile space marking it at the same time an imperial property. The boundary protected abstract entity which figured on the map became the first and most authoritative referent to reality, making the representation more real than the actual itself. The artificially constructed space which derived consolidation through the cartographic image, was in effect, a discursive formation of science and rationality. As cartography made visible, so

444 Osborne 2000, 5-6.
445 Del Hoste co-authored the Route Book of the Mission to Sind in 1833, with Sketch Maps with Lt. Patterson.
A Burnes constructed a map of Indus and the Punjab rivers along with a paper which elaborated the process of its construction.
John Wood (1812 - 1871) was an officer of the Bombay Marine. He visited many of England's colonies and finally became the managing Superintendent of the Indus Flotilla, and lived for many years in Sind.
446 Wood 1841.
surveys made accessible the remotest spaces on earth. Vision entailed control, knowledge led to power.