Anatomical Knowledge and Anatomy of the Medical Knowledge: Some (post)Colonial Indian Inquiries

THESIS

SUBMITTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (SCIENCE)

OF

THE UNVERSITY OF NORTH BENGAL

2008

BY

Jayanta Bhattacharya

University of North Bengal

Raja Rammohanpur, Dist: Darjeeling,

PIN: 734430, West Bengal, India

Dedicated to my late father

Vivekananda Bhattacharya who

taught me to read, think and learn

and

my late mother Karunamayee with a big heart, who donated both her body and eyes for the furtherance of science.

Prof. Samar Deb (MBBS, MS),

Principal, College of Medicine & JNM Hospital,

WBUHS, Kalyani, West Bengal

(Ex-Prof. and HOD, Department of Anatomy,

North Bengal Medical College, West Bengal)

TO WHOM IT MAY CONCERN

This is to certify that the thesis entitled "Anatomical Knowledge and Anatomy of the Medical Knowledge: Some (post)Colonial Inquiries" submitted for the award of the degree of Doctor of Philosophy of the University of North Bengal, is a record of authentic research work carried out by Jayanta Bhattacharya, MBBS, under my supervision. He was enrolled at this University on 20.10.2003. His Registration Number is 280001. No part of this thesis has been submitted for any other degree or diploma. The help received from various sources has been duly acknowledged. There is nothing in his habits and character which may debar him from being admitted to the degree.

Samar Deb 19.01.10

(Samar Deb)

Supervisor

Table of Contents

Acknowledgement

I hope that it would not sound superfluous if I take resort to Wittgenstein – "Knowledge is in the end based on acknowledgement" (*On Certainty*, 378) – for paying my serene feelings to those persons who are in some way or other have made this work possible. It is also an Indian way of expressing one's inner currents of emotions. If my father were, there he would have been the happiest living person to see this dissertation finished. He does live with me, but does not see it with our 'earthly' eyes. My mother does the job of being both mother and father. She is there even in her far away abode of the mortals to shower her blessings to find it finished. She derives blithesome pleasure to know that it is finally completed.

The person to whom I owe most for my doctoral work are Prof. Samar Deb, ex-HOD of Anatomy, North Bengal Medical College. Prof. Deb is my guide of this dissertation on a rather less-traversed area of history of medicine. He has given his important suggestions particularly at the final phase of the research work. History of medicine is not a cup of tea in the universities of West Bengal. Prof. Deb went beyond this threshold and took deep interest in even quite initial stage of this work and encouraged me to get the paper (titled "The Rise of Anatomical Knowledge in Colonial Medical Education in India") presented at the 54th Annual Conference of the Anatomical Society of India. Dr. Partha Pratim Pradhan was my co-presenter. I also owe to him. Without Prof. Deb's help, this research could never be possibly presented as a PhD work.

My close associates with whom my living becomes meaningful and I draw my sustenance are Dr. Dilip De Sarkar, Anjan Majumdar, Pratap Agarwal, Debu Saha, Sarmistha Roy, Paltan and Pratik Chakrabarty. Dilip Babu has acted many a time like my 'academic advisor' in his grand role to point out some inconsistencies of my work. Would he accept my thanks? Better not to make the list longer. Still I have to mention some of my well-wishers. They are Kali, Anu, Apurba, Sumantra, Shibu Bhadra, Masima (Ranjita Bhowmik) and so many other people. All of them remained anxious about difficulties faced by me. Any kind of human touch and tenderness make one enlivened to proceed further. In this sense, I am perhaps indebted more to my 'non-academic' friends than to 'academic' ones. I must mention of my Ranagamasi (Maya Bhattacharya) all the

staff of Visva Bharati Central Library and archives. They have provided me incessant help to find so many rare books and documents at my disposal. In addition, to note, appearing always with a smiling face. Other libraries coming to my help are National Library, Kolkata; Bangiya Sahitya Parishad Library, Kolkata; National Medical Library, New Delhi. My sincere thanks go to the staff of West Bengal State Archives. They were always helpful and careful to guide me to get at the correct document. My foremost academic friend was Bapin (Anirban Das). He goes on playing the same role in my life till now. I owe to him. Amitda (Amit Ranjan Basu) is of that genre which comes to help with its fountainhead whenever needed. He is my friend to reckon with. Deepak Kumar though separated geographically and institutionally, is a constant source of encouragement of my research work. I remember him. General Secretary (Hon.) of Paschim Banga Vigyan Mancha is inquisitive and hopeful about this work. This is the moment to acknowledge him.

I acknowledge A. K. Bag of Indian National Science Academy (INSA). INSA has given me Research Associateship in History of Science, which was of help to finish my PhD.

On my part, I am incapacitated by two quite gnawing handicaps: first, absence of full scale institutional (in academic sense) environment during the whole period of this study, and, second, individually lacking an academic milieu wherein my lacunae could be judged and counter-arguments could be faced.

This deficit has been partially mitigated by an altogether different ambience of continuous psychic and mental nurturance from my family – sometimes hotly debating, even quarrelling and sometimes in a very jovial and playful environment. All these episodes form the collage of a human life in which I am embedded. This spectrum of my life is constituted of all my family members – Bhaskar (my brother), Chandana, Kalpana, Didi (elder sister) and my late Dada (elder brother). My 'disciplining' *femme fatale* (Dipa) has always absolved me from my 'so-called' family tasks. Should I thank her? Dipa was the invisible (sometimes transcendental) and perpetual source of *élan vital*. Knowledge, if any, should not make me ignoramus or so unscrupulous to thank her with a formal acknowledgement. She is there with me.

Finally, the three kids of ours – Jayishnu, Jayanee and Jayarshi – have created the canvas against which this preliminary, fractured and inadequate research work (yet, hopefully, aspiring to provide some new areas of inquiries) could only be produced. They are all playing with bountiful of life within this hard-labored study. They always provide me the lifeline – not to break down while doing it always solely. They did it in the truest sense.

Jayanta Bhattacharya 19/1/16

Jayanta Bhattacharya
Tulsitala
P. O: Raiganj
Dist: Uttar Dinajpur
West Bengal
India
Pin: 733134

Introduction

> The practice of medicine of the ancients was an art, and not a science, and dignity it did not acquire until it was based on acquaintance with anatomy and physiology. – (Leidy, 1859).

Since antiquity the study and practice of medicine hinges around a few ontological and epistemological questions. What is health? What is disease? What is body? Why the body of mine gets afflicted? For almost 150 years the dominant model of disease we have had in Western developed societies has been that many diseases are caused by some *encounter* of the human body with some dangerous element (or a *failed* encounter with some necessary element) 'out there' in Nature. (Cunningham, 2002) "To become a patient is to establish a healing relationship with another who articulates society's willingness and capability to help." (Marinker, 1975: 84).

From the puzzles about the body, even about any one of its cells, it is a short ride to riddles concerning the ultimate causes of the universe and enigmas about the meaning of existing in time. (Sullivan, 1989) As a result, the questioning of medicine can never be restrained, because the sickbed is maelstrom of forces that are historical as well as organic. If society and science view medicine or art of healing in an all-encompassing way, the problems, and, more importantly, the solutions will be understood following this line of thinking. If, on the other hand, science and society view medicine as an industry and a market commodity, the problems and solutions will be understood as industrial and mercantile in nature.

To understand disease inside the body one has to grapple with the knowledge of the body. The physical examination, medical imaging and other procedures, as well as the elements of the medical history, all generate clinical data that pertain to anatomical entities in the human body. Dissection-based anatomical analysis facilitated the classification of bodily components, the development of a vocabulary for describing the body with clarity and precision and mapping the bodily organs and their surface projections, which would be later used in physical diagnosis. (Older, 2004)

Against this background, it is useful to remember, "A full, or even adequate, discussion of the "kinds" of anatomy would be in effect a history of anatomy, and a partial history of medicine, biology and natural philosophy." (Cunningham, 1975)

Hence, anatomical knowledge becomes a window to locate history, evolution and progress of medicine when two cultures of medicine are poised vis-à-vis. Such was the scenario in India of which I shall talk about in my dissertation. India's own systems of healing had to face a formidable and domineering system of medicine from the British.

Two ancient, rich and distinct paradigms of medicine and health are – (a) Greco-Roman-European, and (b) Āyurvedic. Both these systems have differently dealt with the above mentioned questions. Modern European medicine is a definite disjunction from the Greco-Roman lineage, occurring during the 16th-18th centuries. Humoral theory of Greco-Roman medicine was replaced by pathological anatomy and organ localization of disease. Anatomy has a long and checkered past as a scientific discipline. Its heyday came in the 19th century, with the development of quick, effective surgical techniques on the battlefield and, later, the introduction of anesthesia, when knowledge of the structural intricacies of the body began to have practical significance for doctors.

Against this background, this thesis does not aim to deal with any 'hard' clinical anatomy, nor is it an attempt to scrutinize vertically or horizontally the history of medical knowledge in India. Rather, this thesis tries to put a modest attempt to look into the issues of encounters in anatomical knowledge as contained within both ancient Indian medicine (Āyurveda in my discussion) and modern medicine introduced in India through the British. An important mention may be made here. In 1823, H. H. Wilson commented on the medical and surgical sciences of the Hindus, "they attained as thorough a proficiency in medicine and surgery, as any people, whose acquisitions are recorded, and as indeed was practicable, *before anatomy was made known to us*, by the discoveries of modern enquiries."(Wilson, 1823: 207) It becomes self-evident from this observation that the benchmark of distinction of European medicine from all other traditional and indigenous medical practices is anatomy. Throughout this dissertation, we shall try to explore this issue.

During doing study, the locus of this research work passes through some historical facts which have not yet been adequately taken into consideration. It might be more

propitious for us to look into issues involved with medical and anatomical encounters at the level of epistemology of both modern medicine and Āyurveda. Briefly, as such, Āyurveda has to apply itself mostly to medical matters, and thus it is justified to speak of it as 'medicine' provided one regards this term as an approximation and not as an exact equivalent of what one normally understands as medicine (Western medicine) today. (Das, 2003) Besides Āyurveda there are two other important streams of Indian medical practices being practiced for centuries, namely Unani and Siddha.[1]

This dissertation does not deal with those two systems. Modern medicine is understood to be the medical practices following the introduction of Western medicine and patronized by the British government. More specifically, after the foundation of Medical College in Calcutta in 1835 anatomical dissection was introduced in medical curricula. In the present study modern medicine is representative of that period. European colonialism established itself decisively in the Indian subcontinent in the period from 1770 to 1830 through modern regime of disciplinary power (somewhat in tune with Foucault), though, coming at the colonial margin, this disciplinary power (including medicine) would "at the same time be compromised, and, even, subverted, by the need to maintain a specifically colonial form of power." (Chatterjee, 1996)

Though this research work is concerned with medicine, institutionalization of colonial medical science and some partial accounts of anatomical details of the body (rather than with philosophical issues involved with modern medicine and Āyurveda), it does not pertain to scientific study per se. Following Frits Staal, this approach is scientific to the extent it is based upon the assumption that Āyurvedic medical practices "can be studied like other objects and are not beyond the pale of an investigation that is empirical and rational and therefore akin to science." (Staal, 1996: 1)[2] To note, while making any

---

[1] Āyurveda does not mean any homogeneous structure. From the classical period (roughly, some centuries B.C to a few centuries A.D.) to the intermediating periods of various redactions it has undergone significant changes. Two basic constituent features remained unchanged throughout the ages – (a) disease perception through *tri-doṣa* theory, and (b) avoidance of any anatomical dissection or taking case history of a patient. Moreover, since the period of Āyurvedic revivalism during nationalist movement to the present time different Āyurveda-s have come up. Arguably, the three principal strands of such Āyurveda-s are 'modern' Āyurveda, *śuddha* Āyurveda, neo-āyurveda or 'New Age' Āyurveda.

[2] Some of the importatnt scholars, besides Staal, are Dominik Wujastyk, G. Jan Meulenbeld, Rahul P. Das.

attempt to explore into the history of anatomical encounters it is almost inevitable to read the old texts in the light of post-Enlightenment, post-Vesalian and post-Harverian mindset. Wujastyk makes us aware of this problem. (Wujastyk, 1998) Specifically speaking on botanical terms, Meulenbeld has drawn attention into puzzling inadequacies to locate "botanical equivalents of Sanskrit plant names". (Meulenbeld, 2009) He traces the problem to create the significance of a scientifically looking pharmacopoeia for the Indian Āyurvedici in their competition with western medicine. In a more scathing note. "A keen observer among the moderns...will be shocked at the amount of intellectual dishonesty and chicanery with which the Ayurvedic texts have been treated to make them resemble the modern texts." (Das, 2003: 6)

Anatomical Knowledge – Rise of Hospital Medicine – 1794 – Colonial India

Quotations from one of the most celebrated textbooks of medicine have got some bearing with the present study. An attempt is made here to 'anatomize' medical knowledge (as is understood today). It is also an attempt to understand the specific intellectual history of dissemination of scientific knowledge of medicine – the specific contingencies of power and agency – which determined why and how āyurveda and Unani now flourish as parallel 'disciplined' forms of medicine, whereas 'Hindu chemistry' was virtually stillborn. (Chatterjee, 1996)

"The hospital is an *intimidating environment* for most individuals. Hospitalized patients find themselves surrounded by air jets, buttons, and glaring lights; invaded by tubes and wires; and beset by the numerous members of the health care team—nurses, nurses' aides, physicians' assistants, social workers, technologists, physical therapists, medical students, house officers, attending and consulting physicians, and many others. They may be transported to special laboratories and imaging facilities replete with blinking lights, strange sounds, and unfamiliar personnel; they may be left unattended for periods of time; they may be obliged to share a room with other patients who have their own health problems. It is little wonder that *patients may lose their sense of reality.*" (Harrison's, 2008: 8)

A few facts can be extrapolated from the above mentioned statement – (1) hospital remains an intimidating environment for most individuals (not 'patients', to note),

and (2) patients become too vulnerable to lose their sense of reality. It can be assumed that doctors, in such instances, become the only tenuous link between the 'reality' of hospital and that of patient's domestic setting. Medicine is the intervening agent between the two realities of the patient. An Indian instance can be cited here. Charles Lushington, while he describes the details of the first General Hospital of Calcutta about two hundred years ago, comments, "The idea of entering a Hospital for relief, though it is usually administered with skill and humanity, is repugnant to the feelings of the meanest individuals, and excite a sensation of *forlornness* even in the minds strengthened by education." (Lushington, 1824: 292)

Losing 'sense of reality' in 2007 makes sense with 'forlornness' of 1824. In both cases the patient is divorced from his/her domestic setting and rendered to be measurable and reparable under the authority of medicine. Rise of Hospital medicine as described by Erwin Ackerknecht is a milestone in the history of medicine. (Ackerknecht, 1967) Before the rise of Hospital medicine not only did the bedside physicians believe that external nature and human thought worked the same way and by the same principles, they also believed that this structure could be displayed through the use of unaided senses. (Fredriksen, 2002) During this phase, diagnosis was made by the elucidation of symptoms, and treatment was based on *a priori* theory applied with heroic vigour. (Newman, 1958) Along with Hospital medicine there came up the absolute importance of anatomical knowledge. For example, "You will perceive that my observations are chiefly limited to a detail of the most important *pathological* observations made in our *wards* during the preceding months." (Graves, 1837: 523)

In the first edition of *Harrison's*, already quoted above, there was a cautionary note, "Tact, sympathy, and understanding are expected of the physician, for the *patient is no mere collection of symptoms, signs, disordered functions, damaged organs, and disturbed emotions*. [The patient] is human, fearful, and hopeful, seeking relief, help, and reassurance." (Harrison's, 2008: 1) Such statements inform us about a different situation where person of the patient is always at the risk of being reducible to pathology inside the body. In more recent time, Dr. Groopman talks about a great case, "key elements of "a great case": the initial misdiagnosis, the confluence of disparate symptoms and signs of an unusual disease, the instance when standard therapies can be paradoxically harmful,

the complex coordination of medical and surgical management." (Groopman, 2004) The concept of a 'great case' leads to necessary clinical detachment that, in practice, physicians, and especially surgeons, has always had to learn to cope with the more revolting aspects of their art. (Payne, 2007: 1) Quantification in medicine is part of the growing trust in numbers that has gradually affected all aspects of social life during the past centuries. More narrowly, it is part of a process of objectification in clinical medicine that has been going on since at least the eighteenth century. It has been most evident in diagnosis, which has come to depend less and less on patients' accounts or physicians' subjective judgment and more and more on objective signs that, in theory at least, transcend subjectivity and compel agreement among qualified observers. (Weisz, 2005)

Perhaps it would not be much irrelevant to mention that 'subjective' decision to tackle an 'objective' case is still a grey zone of medicine – a zone of uncertainty. Even during the 1950's treatment of hypertension was quite empirical, more dependent on individual choice than based on standardized therapy. Three major physicians in the realm of anti-hypertensive treatment were Walter Kempner, Reginald Smithwick and Wilkins. Kempner prescribed a diet composed primarily of rice and fruits. It caused ketosis, weight loss and a decrease in blood pressure. (Chobanian, 2009) Chobanian comments, "The full diet was difficult to follow... some patients with severe hypertension benefited and survived until effective drug therapies became available." (Chobanian, 2009: 878)

The first part of the title 'Anatomical Knowledge' does need some clarification. It is inclusive of both Āyurvedic anatomical knowledge and that of modern medicine within its ambit. Why so much focus is being laid on anatomical knowledge? One attempt to answer this question may be explained thus. Anatomical dissection, in Euro-American experience, was far from being butchery. It became the quintessential epistemology of scientific, 'civilized' man, a systematic and careful division and reduction of the material world. It was also a triumph of mind over matter, reason over emotion. Anatomy, it was asserted, provided a geography of embodiment that could produce morally ordered, physiologically self-governed 'individuals' – and a morally ordered, physiologically self-governing society. "Dissection was a potent method of producing and disseminating

knowledge – a powerful technology for operating upon the human body – but also a powerful metaphor." (Sappol, 2001: 2-3) Possibly, it would not be an exaggeration if one says that it is the knowledge of *anatomy* that has made *medicine modern.* That is why *New England Journal of Medicine*, while "Looking Back on the Millennium in Medicine", places **Elucidation of Human Anatomy and Physiology** in the first place among the ten most important achievements of medicine. (Brenner, 2000)

To remember, the body (in Western culture) since Aristotle's time was worthy of attention for its own sake, not merely as a means of achieving medical purposes, and anatomy became a discipline, with its own methods of procedure, and formalized within a framework of teaching. (French, 1978) No other curricular component has figured as prominently as anatomy in modern medical education. Around 1800 one began to follow Bichat's (1770–1801) maxim "open up a few corpses", as Foucault laconically remarks. (Foucault, 1994: 124) Illness and disease became not a matter of the whole body, but were located in body parts and their pathologies. Bichat taught, "You may take notes for twenty years from morning to night at the bedside of the sick, and all will be to you only a confusion of symptoms...a train of incoherent phenomena. (But start cutting bodies open and, hey presto), this obscurity will soon disappear." (Porter, 1999: 307) According to him, we should "dissect in anatomy, experiment in physiology, follow the disease and make the necropsy in medicine; this is the three fold path, without which there can be no anatomist, no physiologist, no physician." (King and Meehan, 1973: 532)

In the domains of eighteenth and nineteenth-centuries anatomy and physiology, general anatomical facts were extracted from observations and considered as possible causes in an Aristotelian perspective.

Furthermore, from a philosophical point of view, anatomy is not merely the structural biology of human species, which happens to be human. Because we are self-aware, the study of the human has a unique place in establishing the image we have of ourselves; ultimately, the *prosaic* descriptions of the bones, muscles, blood vessels and neural pathways are the context of our experience of life. (Gray's, 1995: 2) Changes in the culture of medicine have carried anatomy from a research science, to a training tool, nearly to a hazing ritual, to a vehicle for ethical and moral education. Physicians, scientists, and medical students, as well as observers such as sociologists and writers,

have been only intermittently aware of these cultural shifts. Yet anatomical dissection has been a remarkably persistent feature of medical education – indeed, it stands out as the universal and universally recognizable step in becoming a doctor. (Dyer and Thorndike, 2000)

During the first half of the 19th century, gross anatomy held an intellectual centrality to Western medical science, surpassing anything it enjoyed before or since. Science meant empiricism, epitomized by systematic empirical correlation of symptoms observed at the bedside with lesions found at autopsy. Not only that, privileged access to the body, gained through the knowledge of anatomy, marked a social, moral, and emotional boundary crossing that conferred new knowledge and reforged sensibilities. However, to note, corpses used in medical education are traditionally "depersonalized and biography-less" (Richardson, 2000). The dissecting room became a site of epistemological exhaustion – fixed and unchangeable. (Warner and Rizzolo, 2006) By the twentieth century, dissection has become the exclusive purview of scientists and a mandatory rite of passage for all doctors. "Anatomy has a long and checkered past as a scientific discipline...Today, the teaching of anatomy is at a crossroads. As an introduction to the language of medicine and an underpinning of the study of pathophysiology, anatomy remains an essential component of medical knowledge." (Schaffer, 2004)

Anatomists have always had to walk the thin line between scientific objectivity and public spectacle. (Korf and Wicht, 2004: 805) Along with the advancement of anatomical education the language of 'sympathy,' owing to its alleged gendered association with Victorian feminine sentimentalism, was marginalized. It was replaced by the term 'empathy.' To keep in mind, by the late 1960s, terms such as 'dehumanization', which once had belonged to the rhetoric of the radical left had been taken up by a section of anatomists. (Warner and Rizzolo, 2006: 410) However, interestingly enough, "even a precise anatomical knowledge could not prevent grievous errors of treatment." (Reiser, 1993) Nevertheless, not all these historical developments could prevent the march of horrific treatment and precise organ localization of disease hand in hand at least until the middle of the nineteenth century. For example, during the treatment course of a person named James Fraser, aged 24, 10 ounces of blood letting was done on the first day of

treatment in the year 1836. On the succeeding days (a) 20 ounces blood were cupped, (b) six leeches were applied to the temple, (c) 16 ounces of blood-letting along with a bolus of 6 grains of calomel and 12 of jalap given, (d) a blister and 12 leeches applied, and, finally, (e) "on the 9th day he left the hospital quiet well, though rather weak." (*The Edinburgh Medical and Surgical Journal*, 1836)

Medicine produces metaphors. On its turn, metaphors go on multiplying new metaphors. (Boyd, 2000; Leach, 1975)[3] However, problems may arise when a metaphor expands in a sphere where it is not challenged or complemented by other equally powerful metaphors which are also expanding. In that case the metaphor in question may go on expanding its application almost indefinitely. If health is "a way of tackling existence" in which "one is not only possessor or bearer but also, if necessary, creator of value, establisher of vital norms", then what constitutes health in one person may well, as Nietzsche said, "look like the opposite of health in another person." (Boyd, 2000: 15) In the 18th century, when doctors turned to mathematics to produce a Newtonian map of the body, the metaphor of hydraulic pumps was used to express human digestion and blood circulation. (Turner, 2006) Medical metaphors fill in the vacuum, especially, when religious or cultural metaphors get marginalized in contestation with the new emerging normative regime of science or medicine.

Anatomical metaphors became the call of the day following colonial medical encounters in Indian context. Terms and images plucked from the colonial language of medicine and disease began to infiltrate the phraseology of Indian self-expression (or, put otherwise, Indian subjectivity), to become part of the ideological formulation of a new nationalist order. (Arnold, 1995: 241) These terms and images were primarily moored on superiority of anatomical knowledge, excellence of surgical practices and, at a later period, diagnostic and therapeutic marvels.

The clinical observations and illustrations of earlier East India company surgeons like Charles Morehead, James Annesley, Peter Breton, E. A. Parkes and others derived

[3] Leach comments, "Despite the obvious discrepancy from reality, the model of ideal good health which ordinary members of the public pick up, through the visual images of the Press and the TV screen and from the verbal suggestions of their doctors, is closely related to the classical ideal of the youthful Greek athlete."

their claims to scientific objectivity and authority largely from their studies of morbid anatomy, pathological study and their attempts to relate the state of the diseased organs examined post-mortem to symptoms manifested externally during life. An example may be cited here. In a case of *Ischuria Renalis* (acute retention of urine) – presented by J. Bird on April 7, 1827, before the *Medical and Physical Society of Calcutta* – dissection was done after death and the ensuing treatment plan of future was "Would it not, therefore, be advisable, after bleeding the patient...applying a blister to his loins, to administer calomel in ten grain doses...? This certainly is the plan I would pursue in future..." (Bird, 1829) Medicine, during colonial period, was intricately related with metaphors of higher civilization, (Praksh, 2000) and invasion. (Otis, 2000) Anatomy seems to be emerging as a different sort of discipline if it is viewed from the perspective of its cross-cultural nature, evolutionary history and its evolution to become universal through the advent of modern or bio- medicine. Colonial domination over various regions and cultures has given it its distinct shapes. Many a time it has become a tool and technology too, for establishing superiority of Western medical culture specifically and the West in general. Quite apart from their excursions into trade, "the Surgeons of the Company were frequently employed on activities outside the practice of medicine." (McDonald, 1955) In the early days of the Company, the doctors went with the traders and were often of great assistance, "by virtue of their medical treatment which they could offer to rulers from whom concessions were required." (McDonald, 1955: 13) It will be revealed later that anatomical teaching in India, like English literature studies during colonial period in India, "prompted a series of experiments that could not readily be tried in England because of...firmly entrenched orthodoxies and traditions prevailing there." (Visvanathan, 1989: 7)

Though the British had come in contact with India for a long time they did not have any knowledge of Indian surgical craft. Contrarily, they used to scoff at the Indian practitioners for their rueful knowledge of anatomy. I would rather argue that witnessing a case of successful rhinoplasty might have drawn their avid interest in ancient Indian medical and surgical practices. B(arak). L(ongmate) wrote to the editor of *Gentleman's Magazine*, "A friend has transmitted to me, from the East Indies, the following very curious, and, in Europe, I believe, unknown chirurgical operation, which has long been

practiced in India with success: namely, affixing a new nose on a man's face." (*Gentleman's Magazine*, 1794) The first description of a case of forehead flap Rhinoplasty appeared in the *Madras Gazette* of 1793. A 'Maharatta' (Marathi) by the name of Cowasjee (though, he seems to be a Parsee) was a bullock cart driver in the employment of the English Army in the Mysore War of 1793. He was captured by Tipu Sultan's soldiers who cut off his nose and one of his hands for his treachery. Cowasjee joined the Bombay Army near Srirangapatnam with a cut nose. He was a "pensioner of the Honourable East India Company." It was reconstructed by "a man of the Brickmaker caste" of Satara near Poona. "Two of the medical gentlemen, Mr. Thomas Cruso and Mr. James Trindlay (Findlay), of the Bombay presidency, have seen it performed..." (Longmate, 1794: 891) He gave a vivid description of the operation. The procedure of surgery was also reported by him in the *Magazine* under the title "Curious Chirurgical Operation". His nickname was B. L. Suśruta's version has the skin flap being taken from the cheek; Cowasjee's was taken from the forehead. Subsequently, the details and an engraving from the painting were reproduced in the October 1794 issue of the *Gentleman's Magazine* of London. (Joseph, 1987) There were also drawings of the portrait of Cease with his repaired nose. B.L. commented, "This operation is not uncommon in India, and has been practised from time immemorial." (*Gentleman's Magazine*, 1794)

We shall see later such a specialized surgery by the Indian low-caste people was based not on anatomical knowledge of the body, but regional anatomy which was taught in *Suśruta Saṃhitā* through the knowledge of *marmans* (vital/lethal points).

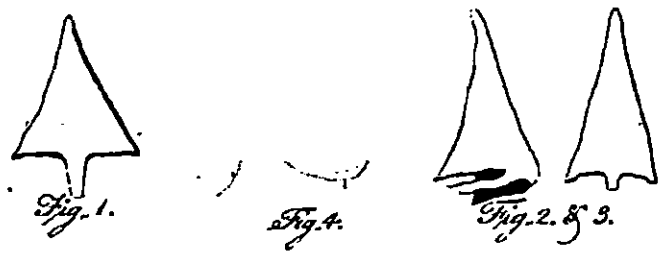


Fig. 1 [Drawings of the skin flaps used in the operation – copied from the *Gentleman's Magazine* 1794.]

It was admired by other travellers too. "I MUST by no means omit one branch of European surgery, that has of late been practised with great success by a *Poonah* artist, who has lately revived the *Tailacotian* art, differing only in the material...The sufferer applied to the great restorer of Hindoostan noses, and a new one, equal to all the uses of its predecessor, immediately rose in its place. It can sneeze smartly, distinguish good from bad smells, bear the most provoking lug, or being well blown without danger of falling into the handkerchief." (Pennant, 1798: 237) We should note the term "Poonah artist." The skill of the 'surgeon' was so admirable to Pennant that the person has been likened with an artist. Longmate's letter appears to have fired the imagination of the English surgeon Joseph C. Carpue (1764-1846) who initially practiced the Indian method of rhinoplasty on cadavers, and waited until a suitable patient presented himself. Carpue performed his first two rhinoplasties in 1814 and 1815. In 1816, Carpue published the results of these attempts in his landmark work: "An account of two successful operations for restoring a lost nose from the integuments of the forehead." (Carpue, 1816; Graaf, 2009)

Fig. 2

Fig. 2 Cowasjee's portrait with the reconstructed nose.

[**Courtesy:** Wellcome Library, London. **L0017597 Credit:** Wellcome Library, London. Indian method of the restoration of the nose by plastic surgery, from article by B.L. to Mr. Urban, concerning Cowasjee, a man who had his nose reconstructed with the aid of plastic surgery. **Line engraving** 1794 By: **Longmate From:** Gentleman's Magazine By: **B.L. Published:** 9th October 1794 Volume 64, part 2, facing page 883.]

Before 1794 the most remarkable work on India by the East India Company was *A Code of Gentoo Laws*. Its purpose was specifically stated, "From hence therefore may be formed a precise idea of the Customs and Manners of these People, which, to their great injury have long been misrepresented in the Western World...In a Tract so untrodden as this, *many Paths must be attempted before we can hit upon the right.*" (Halhed, 1776)

All the major books on Indian or Hindu medicine were published after it. J F Royle found in 'Hindoo' medicine "much fanciful Anatomy, imaginative Physiology, and absurd attention to numbers..." (Royle, 1837: 48) One of the earliest works on materia medica of India/Hindu was of W. Ainslie (1813). H. H Wilson's much discussed work "On the medical surgical sciences of the Hindus" was published in 1823. *Commentary on the Hindu System of Medicine* by T. A. Wise came out in 1845. Hence, it may not be a wild guess that the impetus to know of Indian medicine and surgery was an outcome of the just mentioned report in *Gentleman's Magazine* 1794. Albrecht Weber noted regarding Indian surgery, "in this department European surgeons might perhaps even at the present day still learn something from them, as indeed they have already learned from them the operation of *rhinoplsty*." (Weber, 1892: 270) Arthur Macdonnell too was of the same opinion, "In modern days European surgery has borrowed the operation of rhinoplasty...from India, where Englishmen became acquainted with the art in the last century." (Macdonell, 1900: 437)

Besides rhinoplasty other two much discussed Indian surgical crafts were perineal lithotomy and indigenous couching. I shall provide some evidences on these two Indian techniques later on. It must be mentioned that in the realm of medicinal treatment, in their initial years, colonial masters were not much superior to their Indian counterparts. It was

the realm of surgery where they reigned supreme. Their surgical excellence was solely based on accurate and precise anatomical knowledge of the body where Indians and Āyurvedics were lamentably deficient.

William Carey, while producing the Bengali grammar, observed that the advantage of being able to communicate useful knowledge to the heathens, with whom they were having a daily intercourse was confessedly very important, especially to point out their mistakes. (Carey, 1818: vi) Charles Trevelyan jubilantly noted that European anatomy had also been introduced and in the Sanskrit college of Calcutta, European anatomy and medicine had nearly supplanted the native systems. (Trevelyan, 1838: 7) He also noted, "We shall be perfectly content if native students should be found to think as justly , and write as beautifully, in English, as Buchanan, Bacon, and various others did in Latin; or, to come nearer our own times, and in a professional walk, as Harvey, Sydenham, Boerhaave, Haller, Heberden, and Gregory did, in the same language." (Trevelyan, 1838: 215)

William Hunter spiritedly observed that modern English education had created a new nexus for the active intellectual elements in the population. It was a nexus which was beginning to be recognized as a bond between man and man and between province and province, apart from the ties of religion, of geographical propinquity, or of caste: a nexus interwoven of three strong cords, a common language, common political aims, and a sense of the power of action in common – the products of a common system of education. (Hunter, 1891: 1) It is obvious from the observation that a new kind of state making was in the process, the nation state. H. H. Wilson observed, "The divisions of the science (i.e. Āyurveda) thus noticed, as existing in the books, exclude two important branches, without which the whole system must be defective – Anatomy and Surgery." (Wilson, 1864) Ainslie, another British physician devoted to the making of pharmacopoeia, attempted "to the best" of his ability "to supply what has long been wanted, a kind of combining link betwixt the Materia Medica of Europe and that of Asia." (Ainslie, 1826, Vol. I: 270) On the one hand, deplorable lack of anatomical and surgical knowledge of the Indians were being pointed out time and again and, on the other, a new enterprise to make a complete and nation-wide survey of drugs and remedies of plant origin (materia

medica) were undertaken. The second one was intimately related with the homogenizing enterprise of the making of a nation state.

In Urdang's insightful analysis related to Europe, "It was for the sake of uniformity in the preparation of drugs and the adaptation of the formulas concerned to the special needs and resources of the political units involved that the official pharmacopoeias came into existence...An own pharmacopoeia became gradually a matter of national ambition, a part and a proof of national sovereignty and unity." (Urdang, 1946) In Indian context, producing new pharmacopoeia was related with bringing about homogeneity amongst numerous synonyms of Sanskrit names and their regional variations. (Ainslie, 1826, Vol. I: xi; Vol. II: v) He noted too, "medicine in India is still sunk in a state of empirical darkness." (Ainslie, 1826, Vol. II: v)

Making a national pharmacopoeia was not only intended to make a unified Indian nation, it did also make a canvas over which profits for the Empire could be efficiently measured. It was reported at the Amsterdam Exhibition of 1883 that 'Dhadka grass (unidentified)' would yield a good amount of paper. At the "wholesale rate of 6d. per lb. in Calcutta would represent an income of £84,000 per year... mills (the Bally mills) have a capital of £96,000, so that in two years by the above arrangement such a capital could be recovered." (Mukhopaddhyaya, 1883: 67) In another estimate, the total revenue of the Government plantations of cinchona in 1881-82 amounted to £27, 221 (inclusive of £14,118, leaving a net profit of £13,033). (Hunter, 1883: 305)

It is ironical to find what was counted as *knowledge* in Indian context got transformed to be mere *information* to the colonial enterprise of knowledge. It could only attain the status of knowledge again if reified and verified by the knowledge centre in London. So, the journey may be thought of as Indian 'knowledge' > information > reification/verification > 'real' and 'actual' knowledge. Bruno Latour makes a keen observation, "the first to sit at the beginning and at the end of a long network that what I will call **immutable and convertible mobiles.** All these charts, tables and trajectories are centuries old or a day old;" (Latour, 1999: 227) Latour's analysis becomes more relevant if try understand early colonial enterprise about Indian knowledge. Regarding the journal of the *Asiatic Society* of Bengal it was said in 1833 that "the *Asiatick Researches* comprehended the sum of our knowledge of the classical literature of India; the European

inquirer into that literature began and ended his investigation with this work." (Chtterjee, 1996: 12)

While talking on Europe and technology in the twentieth century David Arnold comments that equating technology with industrial technology as evolved in Europe and North America, saw the establishment of modern technology in Africa and Asia as primarily a legacy of colonial intervention, a boon bestowed by technologically advanced civilizations on societies considered 'backward', even 'primitive'. (Arnold, 2005) These technologies were seen to be modern, progressive and largely benevolent: they constituted a supposedly objective rationale, if not for a dying colonialism, then for the intervention of a superior civilization. Moreover, thinking about technologies of the body thus leads to fundamental questions about the production and performance of European and local identities: there is, after all, no more intimate site of identity than the body. If anatomical knowledge is a part of this new technology, and it does appear to be so, the greatest hurdle and fiercest resistance it had faced was from Āyurvedic practitioners in India. So, methodologically speaking this thesis will try to locate anatomical knowledge within the specific context of ancient India (Āyurveda), pre-colonial India (early interactions and exchanges between two competitive notions and cultures of the body), and colonial India (when modern anatomical knowledge emerges to be the only valid truth about the body) respectively.

A few more queries may be put forward to understand the problem posited in this dissertation. How and why were the colonies such a critical site for the inscription of ideas about European-ness and non-European-ness in bodies, and to what extent did decolonization change these inscriptions? Did encounters between technologies of different origins, valences, and hegemonic aspirations (for example, 'Western' medical ideas vs. ideas of 'alternative medicine') produce different conceptions of bodies? (Arnold and Hecht, 2004)

Body – Paradigmatic Change in Perception

Before the advent of anatomical knowledge, the working model of the body in medicine was of two-dimensional nature – **symptom > illness**. In this conceptualization both **symptom** and **illness** seem to lie on the same plane. Patient's history alone was the

primary source of diagnosis. Though the bodily organs were described, detailed and used to explain disease causation no pathological anatomy was known. Accurate localization of diseases inside the body was inconceivable. As an outcome of emphasis on dissection and experimentation medicine, during the late eighteenth and early nineteenth centuries, made its journey from Bedside medicine to Hospital medicine to Laboratory medicine (and, now, Techno-medicine). Disease began to be seen to being located within a three-dimensional body – $_{\text{symptom}} > ^{\text{illness}} > _{\text{sign}}$. **Depth** or volume of the body – the 3rd dimension – was added to **symptom > illness** perception whereby the body appeared to be truly three-dimensional *in nature*. Doctors were, then, to extract sign, i.e. pathology inside the body. Though situated against the background of Aristotelian and Hippocratic tradition of 'humour' and philosophical syllogism, anatomical study was fortified by two different methods incorporated within the field of diagnosis – (1) Auenbrugger's percussion of chest, and (2) Laennec's mediate auscultation by stethoscope (distinct from im-mediate auscultation). Both these methods, though the first one directly relying on touching the body, and the other premising on distancing it, were to be verified by pathological signs from within the volume of the body. A new norm and epistemological structure began to emerge. Emergent new power of the physician was noted as a source of apprehension as far back as 1826 (just ten years after the introduction of stethoscope). "It has been said that the use of stethoscope may be injurious, by leading the physician to know too much of the danger in a bad case; so as to him despond and *reign the patient* to his fate too soon." (Scudamore, 1826: 12) Every time the stethoscope was (and is) applied to patient, it reinforced the fact that the patient possessed an analysable body with discrete organs and tissues which might harbour a pathological lesion. (Armstrong, 1999) Earlier, in his *De Sedibus et Causis Morborum* (*On the Seats and Causes of Disease*), published in 1761, Morgagni correlated previously recorded symptoms of disease with anatomical lesions uncovered at autopsy.

In a more recent observation it is learnt that the experiences of French medical doctors had in 1832 marked the turning point, in France, between Ancient World interpretations (miasmas and the like) and modern understandings of disease causation. (Watts, 2007: 340) The study of morbid anatomy was at that time beginning to

revolutionize medicine, autopsies were performed and cases of massive albuminuria and dropsy, which were associated with diseased kidneys, were reported. (Foster, 1959)

Three pictures only 50 years apart – pre-Vesalian and post-Vesalian – can help us to get at the issue.

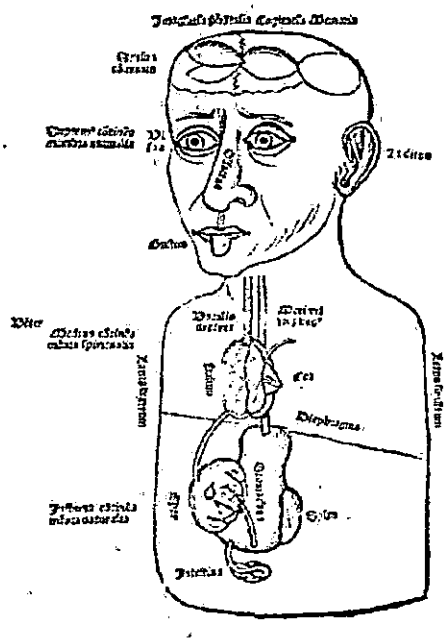


Fig. 3 Two-Dimensional Body of 1499

[Five-lobed liver clutches at the stomach as if with fingers. Intestines are intertwined in an elegant knot. Traditional heart-lung representation is so corrupt as to be virtually unidentifiable. Both are presented on a background of the stomach. Importantly, the localization of organs inside the body is two-dimensional, all lying on the same plane. **Title:** *Anatomy of the human body.* **Creator:** Peyligk, Johannes, 1474-1522, author. **Publication Information:** Leipzig: Melchior Lotter, 1499. **Appears in:** Compendium philosophiae naturalis, sig Q1 verso. **Copyright Statement:** The National Library of Medicine believes this item to be in the public domain. **Order No.**: A013188.
Courtesy: National Library of Medicine, *Historical Anatomies on the Web*, US.]

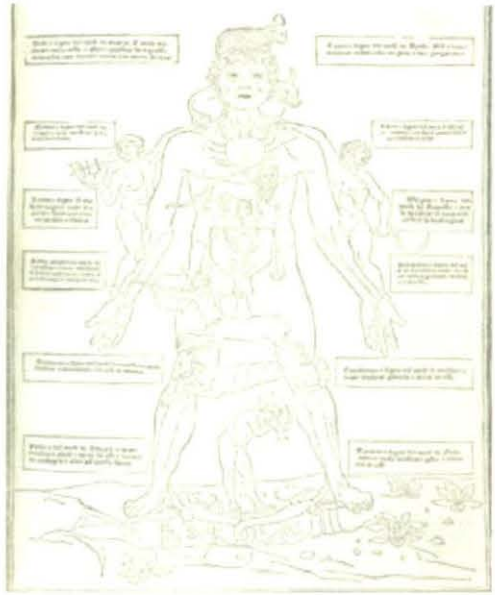


Fig. 4 Zodiac man

['Zodiac Man.', **Johannes de Ketham.** *Fasiculo de medicina.* (Venice: Gregori, 1493). Medical astrology was based on the belief that the body's 'microcosm' corresponded to the 'macrocosm' of the planets and stars and gave order to the seemingly random course of life and health. The book is remarkable as the first illustrated medical work to appear in print. On left side in Latin, "*The Crab is the sign of June; avoid treating the stomach, the spleen, the lungs or the eyes.*" Also, written, "*Libra. When the moon is in the sign of Libra, it is good to bleed... it is bad to treat the stomach and the kidneys.*" **Courtesy:** National Library of Medicine, *Historical Anatomies on the Web*, US.]

Fig. 5 One page (p. 419) from *De corporis humani fabrica libri septem*. (Basel: Johannes Oporinus, 1543).

[Vesalius's *De corporis humani fabrica libri septem* is one of the most influential medical texts ever printed, not only because of the scientific methods used to produce it, but because of the artistic renderings of the anatomist's findings. The famous woodcut illustrations of *De fabrica* influenced the depiction of anatomy for centuries and were often copied outright. In this picture (p. 606 of *De fabrica*) human brain is perfectly illustrated with its clearly evident three-dimensional nature. **Courtesy:** *Historical Anatomies on the Web*, National Medical Library, US.]

Perhaps one of the most important methodological changes characteristic of early nineteenth century medicine was the shift from *observation* to *examination*. (Waddington, 1973) Mr. Thomas Wakley, the famous editor of the *Lancet*, wrote in the February 8 issue of 1824 – "Without anatomy medicine and surgery cannot be acquired; and by these sciences, some of the greatest evils which afflict human life can alone be relieved." (Kandela, 1998) Alliance of nosography with anatomy and physiology, this mutual exchange of instruction, formed one of the characteristic traits of the period. (Beclard, 1823; Henderson, 1829) It becomes apparent that a new paradigm and epistemological structure is prescribed. The patient's own account of illness was relegated – it was *subjective*. What the doctors saw and extracted defined the disease – it was *objective*.

Anatomical knowledge was the benchmark to differentiate between the two paradigms of knowledge – nay, two worlds apart.

Āyurveda – Anatomical Knowledge – Body

In Indian context, Vedic *daiva-vyapāśraya-bheṣaja* (magico-religious medicine) got transformed into Āyurvedic *yukti-vyapāśraya-bheṣaja* (empirico-rational medicine). (Chattopadhyaya, 1977) Mode of reasoning and understanding of disease metamorphosed – the causes of disease could be explained with *tri-doṣa* theory and was understood to being located inside the body. This phase is "marked by a distinctive change in medical thinking, indicative of an epistemology rooted in empirical observations and reasoning based on a humoral theory...This theory has no antecedents in Vedic medicine." (Zysk, 2000b: 84) However, anatomical knowledge did not undergo any change at all in its transition from Vedic to Āyurvedic period. To put it otherwise, Āyurveda did not require any precise and correct anatomical knowledge at all. It had its own explanatory model based on *tri-doṣa* theory. It was more concerned with prognosis than with diagnosis. Hence, precise organ localization of diseases was not a great problem for the Āyurvedics. New prognostic methods also came into use. For example, from about the sixteenth century, a technique developed whereby a drop of oil would be placed in the surface of a patient's urine. The remaining span of the patient's life would be read from the way the oil spread out. (Wujastyk, 1993)

In Āyurveda, the different body parts "referred to in *Saṃhitās*, are mainly those found in connection with diseases and their treatment and the rest have been mentioned in connection with the creation of human body." (Roy, 1967: 36) The structure of the chest, neck sides, vertical column and hand have been described and the number of bones in each case have been mentioned in analogy with the framework of verses, chanted at the time of arranging bricks in the sacrificial altars, constructed in the form of human body and with the number of daily offerings connected with the performances of *yajña* (sacrifice). "A large number of different parts of the body have each a special name and sometimes several names... unfortunately, there are no precise anatomical descriptions in the medical books, lesser still the figures." (Filliozat, 1964: 140)

In *Carakasaṃhitā* (*CS*) –

santi hyarthāntarāṇi samānāśavdābhihitāni, santi canarthāntarāṇi paryāyaśavdābhihitāṇi / samāno hi rogaśavdodoṣeṣu ca vyādhiṣu ca: doṣā hyapirogaśavdamātaṇkaśavdaṃ yakṣaśavdaṃ doṣaprakritisavdaṃ vikāraśavdaṅca labhante, vyādhayaśca rogaśavdamātaṇkaśavdaṃ yakṣaśavdaṃ doṣaprakritiśavdaṃ vikāraśavdaṅca labhante / tatra doṣeṣu caiva vyādhiṣu ca rogaśavdaḥ samānaḥ, śeṣeṣu tu viśeṣavan // (*CS*, Vi, 6.4) [The same word may very well connote different meanings, e.g., the word *roga* connotes both the *doṣa*-s as well as diseases. Again, different terms, which are synonymous, may connote similar meaning, e.g. *doṣa*-s are connoted by words like *roga, ātaṅka, yakṣa, doṣaprakriti* and *vikāra*. For both the meanings *doṣa* and *vyādhi*, *roga* is synonymous; but, finally, regarding *vyādhi rogaśavda* is ascribed a special meaning.]

So, there was always a hiatus in the actual meaning of the words to be filled in by commentators and redactors of the texts. The division of *dhamanīs*, *śirās* and *snāvas* thus seems to have been based on their relative fineness: the thicker channels (*nāḍis*) were called *dhamanīs*, the finer ones were called *śirās* and the still finer ones *snāvas*. It seems to have been recognized that there was a general flow of the liquid elements of the body. This probably corresponds to the notion of *srotas*. It is difficult to guess now what was actually meant by *prāṇa, apāna* etc. (Dasgupta, 1991: 291) Another problem of interpretation emerges with *kloma* (in plural, singular being *kloman*). Caraka counts it as an organ near heart, but he does not count *pupphusa*. He also connects it with hiccough. Cakrapāṇi describes it as seat of thirst. Suśruta speaks of *pupphusa* as being on the left side and *kloma* as being on the right. In *Bṛhad-āraṇyaka*, I, the word *kloma* is used in plural number. The *Bhāva-prakāśa* describes it as the root of the veins, where water is borne or secreted. *Śārṅgadhara*, I.V.45, however describes it as gland of watery secretions near the liver. (Dasgupta, 1991: 288)

In *Suśrutasaṃhitā* (*SS*) [Sā, 5.11] – *nakha* (nails) are the terminal offshoots of the *kandarā*-s (tendon) of the hands and feet. Medhra (penis) is the offshoot of *kandarā*-s which bind *grivā* (neck) and *hṛdaya* (not heart, its position is indeterminate) together and run downwards. *Bhāvaprakāśa* differs with *SS* – here *kandarā*-s are big *snāyu*-s (ligaments?). The word "Nakha Agraparaho" means the place near the nails of hands and feet where the "Kandarās" are inserted. Here the word Medhra is not used for the penis

but it indicates genital organs which can be taken for pubic region. While in Suśruta's account *simanta*-s (suture?) are 14 in number, in *Aṣṭāṅgahṛdayasaṃhitā* they are 18 in number. According to Bhoja, Sevani (Sutures) and Simanta are the same. Arunadatta and Bhoja are in favour 18 Simantas. (Thatte, 2005) These facts point to the contradictory and differing modes of counting organs. To add, Āyurveda does not have any single conception of the body, but a dominant one.

In oral tradition of Āyurveda, mnemonic verses and prose parts were combined to form the text. Mnemonic verses were used to memorize relevant portions of body organs, while describing a disease and its treatment. Though, there was no real contact with the body at all recitations of mnemonic verses from the texts created a condition pseudo-anatomical ambience of continuity of anatomical knowledge. Shifting nature of meanings of terms and the use of mnemonic verses did lead to a unique situation which may be explained through Staal's interpretation, "The fixation of oral tradition by these mnemonic techniques pertains only to the *form* of mantras; there is no corresponding tradition that fixes and preserves their *meaning*. The interpretations of the tradition of ritual and mantras, and the meanings assigned to them have therefore always changed." (Staal, 1996: 373) Meulenbeld makes some keen observations on the evolutionary mechanism of Āyurveda – (1) Statements that appeared to jeopardize the *tridoṣavāda* caught the eye of the commentators and gave them much food for thought in their effort to avert any danger to the prevailing theory. The obvious meaning of some discordant utterances was twisted until concurring with the system. (2) Passages which were ambiguous and susceptible to various interpretations were made to conform. And, more importantly, (3) a conspicuous aspect of the reasonings met with is the tendency to avoid the acceptance of any bodily constituent as a factor capable, independently of *doṣa*-s, of initiating physiological and, more especially, of pathogenetic process. (Meulenbeld, 2008b)

Similar discordance is found in the evolution of the concept of body too. "In a diachronic perspective, however, one may safely assume that quite a number of different body concepts were current at the time of the *CS*'s composition." (Maas, 2008) Moreover, Suśruta's *marman*-theory is considered to be a synthesis of different and partly overlapping systematic anatomical concepts, among which the theory of bodily

constituents as the most comprehensive one served as the model for specific arrangement of bodily constituents in the *marman-* theory. (Maas, 2008: 142-143)

If we look into modern medicine, it will found that the recognition, naming, and classification of disease are central to so many aspects of early-twenty-first century life. If the physician is technologically proficient tends to focus on technological solutions, no matter how expensive it is. But, "Uncertainty influences virtually all of medical decision making... the most worrisome problem of generalizability occurs when receptor polymorphisms and other inherent racial differences cause different responses to the same drugs. Then, the best drug or class of drugs may vary according to the patient's race, just as it varies according to clinical characteristics." (McNeil, 2001: 1612, 1614) Moreover, besides pathological anatomy, microbiology, and other diagnostic procedures, this process is also clearly marked by priorities. They are often rationalized by the idea of progress. However, this description of progress "is not only debatable on its own merits but is also a tautology – molecular research leads to more molecular insights than nonmolecular research." (Aronowitz, 1998: ix)

Importantly, the process of evolution of disease in Āyurvedic system is quite different from the process of evolution of disease from the perspective of modern medicine. In Āyurvedic notion, disease evolves through the following process. A disease is something that gradually made manifest through a continuous process of development. Prodromes (*pūrvarūpa*) develop into full-fledged symptoms (*rūpa*). Secondary affections (*upadrava*) are consequences of the basic morbid process. At the end of this process recovery takes place or fatal signs (*ariṣṭa*) appear, foreboding death. In many cases the enumeration of these signs occurs in the form of verses, more easy to remember than statements in prose. According to P. V. Sharma, pathogenesis in Āyurveda occurs through six stages: (1) *Sañcaya* (accumulation), (2) *Prakopa* (aggravation), (3) *Prasara* (dissemination), (4) *Sthānasaṃśraya* (localization), (5) *Vyakti* (manifestation), and (6) *Bheda* (explosion). (Sharma, 1998: liii-lv)

As noted by Meulenbeld, it is repeatedly observed by commentators that one or more of the symptoms of a particular disease does not fit into the theoretical frame, but is nevertheless present. Such a symptom is *vikṛttiviṣamasamavāyārabdha*: this difficult term expresses that the symptom referred to cannot be explained theoretically as an effect

of one of the morbific entities involved. (Meulenbeld, 2008a: 612-613) Meulenbeld trenchantly comments, "Many Indian authors, on the other hand, readily equate disorders described in the Sanskrit texts with syndromes and diseases recognized in modern medicine." (Meulenbeld, 2008a: 612)

Two interesting examples can be cited here. Shiv Sharma, an eminent Sanskritist Āyurvedic, commented in 1929, "Bacteriologists, as has been stated, believe certain micro-organisms or bacteria to be the root cause of the disease. Such micro-organisms, however, were not unknown to the ancients." (Sharma, 1983: 194) Gananath Sen, another English-trained eminent Āyurvedic of the early twentieth century, endeavoured to establish the 'germ theory' of disease in āyurveda and, to his unique analysis, āyurvedic *vāyu* was explained as "the phenomena under Central or Sympathetic Nervous systems." Quoting from *SS*, Uttaratantarm, chapter 40, he tried to equate germs of modern medicine with 'fine animalculae' of āyurveda. (Sen, 1916) Against such attempts notes of restraint are voiced by erudite Sanskrit and Āyurvdic scholars like P. V. Sharma, "There has been attempts from time to time to correlate the three doṣas with some concrete physiological entities but it has always been futile because the three doṣas are all-pervasive and control all the biological functions and as such it is not possible to restrict them in certain gross substances." (Sharma, 1998: xlvii)

In *SS* –

visargādānavikṣepaiḥ somasūryānilā yathā / dhārayanti jagaddehaṃ kaphapittānilāstatha // (Sū. 21.8) [The maintaining functions of kapha, pitta and vāta are likened to the emission (visarga), absorption (ādāna), and the capacity of imparting motion (vikṣepa) of moon, sun and wind respectively.(Meulenbeld, HIML. IA: 214)]

It is also to note –

sapta sirāśatānibhvanti; yābhiridaṃ śariramārāma iva jalahāriṇībhiḥ kedāra iva ca kulyābhirupasnihyatehnugṛhyate cākuṁcanaprasāraṇādiviśeṣaiḥ / drumapatrasevanīnāmiva ca tasāṃ pratānāḥ; tasāṃ nābhimūlaṃ, tatasca prasarantyurdhvarmadhastiryak ca // (*SS*, Śā. 7.3) [There are 700 ducts. The body is irrigated by these, just like a garden by water channels, and a field by ditches...their ramifications are like veins on the leaf of a tree. Their root is the navel. From there they spread out upwards, downwards and horizontally.]

Dominik Wujastyk notes, "*Suśrutasaṃhitā* does not use a concept of fluid circulation, but rather works with a centripetal fluid distribution starting from the navel." (Wujastyk, 2008) In *Śārṅgadhara-saṃhitā* (5.40-44) and *SS* (Śā, 7.3) we note that all the *śira*-s which are found in the human body are linked with *nābhi* (to note, not the Harverian heart) and there from they are spread all over the body. In stead of gross substances physiological activities (in modern sense) inside body is conceptualized here in terms of harmony with nature – in the paradigm (not in Kuhnian sense) of macrocosm-microcosm harmony. An example from *CS* (Śā, 1.90-91) – In order that flood waters may not damage crops as they did in the past, a dam is constructed as a preventive measure. Therefore, some therapeutic devices are prescribed to prevent certain diseases which are likely to attack living beings in future. (Sharma and Das, 1977: 334-335)] In *Śārṅgadhara-saṃhitā* –

jālāntaragate bhānau yat sūkṣaṃ dṛśyate rajaḥ / tasya triṃśattamo bhāgaḥ paramāṇuḥ sa ucyate // (Pū, 1.15) [When the rays of sun enter through the window and the minute particles are observed thereby, the thirtieth part of that very particle may be called as an atom.]

In this quotation too there remains ecological metaphor to explain bodily disease process which can never be made equivalent with disease conception of modern medicine. If we make a careful scrutiny it would perhaps become evident that – (a) anatomical study was not a part of Āyurveda in its own right and necessity, rather it was a part of understanding disease processes through *tri-doṣa* theory; (b) as human being is the focus of medical treatises so the question of body was given a special attention; (c) body was primarily conceived of in relation to *puruṣa-prakṛti* paradigm; (d) it may also not be superfluous to follow that Malamoud has made a distinction between the terms 'man' and *manuṣya*, where 'man' is related with *puruṣa* and *manuṣya* "is man as different from other classes of beings..." (Malamoud, 2004), and, to remember, Āyurveda is concerned with 'man', (e) "Caraka's list of sages, many of whom are known from Vedic literature, may have been inserted in order to stress the connection between āyurveda and the Vedic tradition, the orthodoxy of its teachings, and its associations with the brāhmaṇas" (Meulenbeld, IA: 2), and, finally, (f) context-sensitive, polysemous nature of āyurvedic words are always at the risk being interpreted according to socio-cultural specificity,

philosophical predominance and particular mindset of the commentator. One of the examples in this regard, "An old word for 'disease' in Indian tradition is *yákṣma-*, which is used in this sense in the Rigveda. The more specific meaning 'consumption' is attested from the time of the pre-classical Saṃhitās... Another word commonly occurring in classical Sanskrit medical texts is *gada-* 'disease'." (Emmerick, 1993: 84, 86)

Explaining diseases inside the body frame was done with the aid of the *doṣa*-s, not through any anatomical organs – "the three doṣa-s support the body, like the pillars (sthūṇā) of a house; the body is called tristhūṇa for that reason; when deranged (vyāpanna), the same doṣas bring about the body's dissolution (pralaya); the three doṣas, together with blood as the fourth, are always present in the body, maintaining it. (*SS*, Śā, 21.3-4) (Meulenbeld, IA: 214) In *tri-doṣa* physiology, disease is internalized and liquefied as vitiated humors run away, hidden in the depths of body channels. No strict demarcation exists between fluids and tissues. (Zimmermann, 1993) Following colonial encounters, as we have seen before, incessant effort was made to link *tri-doṣa* theory with anatomical organs and tissues of modern medicine. Polysemous and context-sensitive nature of these terms and concepts were reconstituted by the enlightened āyurvedic practitioners who were already convinced of the superiority of modern English education. Elsewhere, Meulenbeld observes, "Other facets of transformation of Āyurveda are the decline of surgery, and closely bound up with it, of anatomical knowledge. Surgical procedures like blood-letting and cauterisation fell into disuse." (Melenbeld, 1995) Though, in *SS* – *aṣṭāsvapi cāyurvedatantreṣvetadevādhikamabhimatam, āśukṛyakaranādyantraśastrakṣārāgnipraṇidhānāt sarvatantra sāmānyāca* // (Sū, 1.18) [Śalya is pre-eminent too on account of its quick action, owing to its use of sharp and blunt instruments (śastra, yantra), caustics (kṣāra), and cautery (agni). (Melenbeld, IA: 203)]

However, coming to anatomical and surgical practices, Kunte observes that surgery was much esteemed and could not be neglected in ancient times. In war legs were sometimes broken and iron legs were assumed. Eyes were plucked off or injured and the surgeons artificially helped the warrior. Not only that they would also extract the shafts of arrows lodged in the body and dressed wounds. The basis of their system of pathology was intimately involved with natural vicissitudes. He comments, "The Aitareya Brāhmaṇ

commends the scientific Ārya who demonstrated a correct division of a sacrificial animal." (Kunte, 1902: 8) To him, "The ancient-Ārya possessed a kind of knowledge of anatomy and physiology. He killed the lower animals for his food, and, therefore, was able to distinguish between the lungs, the heart, the stomach, the intestines, the kidneys, and the other Viscera." (Kunte, 1902: 5) On the other hand, recent researches provide evidence that could be taken to show that "in ancient India too (like ancient Greece) certain peculiarities of animal anatomy were falsely taken to be valid for humans also...since it was assumed that the (internal) anatomy of all mammals (including humans) were the same." (Das, 2003: 507) Again, "in the time of Vāgbhaṭa I practical anatomy had fallen into disuse." (Hoernle, 1994: 11) With these observations in mind, texts at hand are found to be not so much conclusive about organs inside the body and their anatomical localization.

Problems arise also in measurement of time, space and quantities too. Bodily constituents are measurable in aṅjalis. Quantities mentioned are: ten aṅjali of watery fluid (udaka), nine of rasa as a fluid resulting from the digestion of the food, eight of blood etc. According to Caraka – individual human height is 84 aṅgula-s, while in Suśruta it is 120 aṅgula-s.

In *CS*, time (or, *kāla*) in relation to disease-production, is described as of two types: *nityaga* and *āvasthika*. –

kālo hi nityagaścāvasthikaśca; // tatrāvasthiko vikāramapekṣate, nityagastu ṛtusātmyāpekṣaḥ // (Vi. 1.22.6) ["Time (means time as) permanent motion and (time) in relation to stages; with regard to this (distinction of time) in relation to stages is linked to a morbid alteration and (time as) permanent motion to seasonal adequacy." (Meulenbeld, 2008a: 157)] *Nityaga* is thought to be related with season and *āvasthika* is related with disease. In *SS*, time is perceived as both an end to life and actions going on. Quanta of time are kāṣṭhā, muhūrta, nimeṣa, kṣipra, etarhi, idāni etc. (Achar, 1998) One example, 1 muhūrta = 15 kṣipra, 1 kṣipra = 15 etarhi, 1 etarhi = 15 idāni, 1 idāni = 15 breathings, 1 breathing = 1 spiration = 1 twinkling (nimeṣa). In another estimate it is measured with respect to kāla, muhūrta, ahorātra, candramāsa, ṛtu, and year. Another point is of quite importance at this juncture. Discussion on *kāla* too is done in harmony with natural rhythm –

kālaḥ punaḥ saṃvatsarascāturāvasthā ca ; tatra saṃvatsaro dvidhā tridhā ṣoḍā dvādaśadhā bhūyaścāpyataḥ prabhijyate tattat kāryamabhismīkṣā ; (*CS*. Vi. 8.125) [*kāla* is of two types – the full year and the physiological changes of the patient. The full year, depending on the movement of the sun, is divided into the three main seasons (hemanta, grīṣma and varṣā). It is further divided into twelve months and so on.]

George Cardona, while tracing some early Indian arguments concerning time, notes that perception of time in India is intricately related with Sanskrit grammar – "The *Ratnaprakāśa* adopts a tatpuruṣa interpretation that is different... Kaiyata's interpretation invokes general time, and thus departs to a degree from what Pātañjali has said earlier." (Cardona, 1991) According to Nyāya-Vaiśeṣika philosophical school (this school of thought has greatly made its contribution to the making of Āyurveda), the appearance of kāla (time) as a separate entity is a creation of *buddhi* (*buddhinirmāṇa*) as it represents the order or mode in which the buddhi records its perceptions. (Dasgupta, 1991: 311) Time, in such a conceptualization, is intimately related with grammar. It is not an entity in itself, divorced from grammatical knowledge. It becomes apparent that this kind of time perception, which may be described as ecological time, does not correspond to the modern notion of time. Time was incorporated within the concept health as the establishment of scales with dichotomies of complementary opposites like *Agni* and *Soma*. Good health, in traditional terms, means harmony and balance. In sharp contrast to modern European conceptualization, in Indian context "Space and time, soils and seasons form two similar domains in which the principle of *appropriateness* is applied." (Zimmermann, 1999: 33) Renaissance notions of the perfectibility of humankind, the importance of individuality, and the possibility of progress originated with a sense of time as a straight line leading to "an end of time" and apocalypse, rather than a circle. (Lee, 2000; Kern, 2000; Hall, 2000) Such perception of time was transformed into clock-time during colonial encounter in India. "Time acquired new meaning and disciplinary authority through an equally abrupt entry of clocks and watches, and there was among sense of moving forward in consonance with its linear progress." (Sarkar, 2002; Kalpagam, 1999) To put it otherwise, it was the concept of 'homogeneous empty time' in which the nation was believed to live in and, in turn, which determined the fate of hitherto existing times. (Anderson, 1991) However, it must be remembered now, similar

examples with regard to the disjunction between social time and the time required for the construction of an industrial society can be had from English experiences too. (Thompson, 1967)

In India, the subjective experience of life-cycle time could now be projected into a new *epistemic* domain rendering it objective, measurable and linear. However, as a counter-argument to 'scientific' notion of time and space, one should remember "myths and stories might not only reimagine institutions such as the state by providing a poignant sense of its powerful interiority but also provide an alternative perspective on both space and time." (Mayaram, 2006: 12) Consequently, time was reconstituted into scientific clinical charts understood as *temporal* physiological changes, and morbid anatomy understandable as *spatial* pathological changes. (Heaton, 2001)

In the hospital setting, clinical charts were being produced consistent with the temporal division that was again consistent with physiological temporal swings arising out of the volume (third dimension) or the solid interiors of the body. By this time, European medicine had undergone a fundamental change "from humoralistic diathesis to solidistic localism." (Ackernecht, 1958; Scharfe, 1999) Even when European medicine was rooted in Galeno-Hippocratic humoral theory two distinct features were conspicuous which were never found in Āyurveda – (a) individual patient's history taking and its documentation, and (b) recording of treatment history of the individual patient (and, later on, in modern medical practice, production of clinical charts which are always 'biography-less' and abstract in nature). For example, Galen's treatment record can be cited. (Horstmanshoff, 1995)

Mentioned by name	***total***	***names***	***percentage***
Elite	15	12	80%
Sophists	26	12	46.2%
Lower classes	23	6	26.1%
Anonymous	110	—	—

Modern researches have discretely quantized each hour of Galen's daily activities. It was different for midsummer and midwinter, keeping in mind Galen was a very hard working person. (Horstmanshoff, 1995: 97-98) These facts are worth pondering for two reasons – (1) unlike Indian medical practice, since long time in European medical history

there was the presence of *individual* as patient, (2) whatever primitive be surgical, anatomical, medical and therapeutic procedures all of these were categorically and cartographically noted as evidence for generations of students to come – it is altogether different from the practice of mnemonic verses, and (3) humoral theory for disease causation and anatomical dissection went in unison (excepting a period of about 1000 years when dissection was prohibited in Christian world).

In Indian medical practice, patients are not individuals they are always counted as nameless social bodies (excepting some prominent royal personalities or sages). Moreover, all the measurements for a person are normalized to his constitution, not standardized. The length of the intestine is three and a vyāma (of that very person). (*SS*, Śā. 5.9) Meulenbeld estimates vyāma to be a difficult measurement to correctly ascertain. There are various measurements according to different commentators (Meulenbeld, 1B: 373)

In *CS* –

pramāṇataśceti / śarīrapramāṇaṃ punaryathaṣvenāṅgulipramāṇenopadiśyate. utsedhavistārāyāmairyathākramam // (Śā. 117) [The norm for measurements of numerous parts of the body is given, the unit of these measurements is the breadth of one's own finger, called an aṅgula. (Meulenbeld, 1A: 36)]

Meulenbeld draws attention to variable measurements by aṅgula.

If we take a deeper look into the discussion so far done, a few points might emerge before us. First, Indian perception of time was reconstituted and the person of the patient was considered to be a conglomeration of pathology inside the body; second, non-standardized Indian/Āyurvedic units of measurements were dislocated and reconstructed into standardized, modern units of measurements in cases of both measuring an organ or unit of time; third, conceptualizing the body consisting of many channels and carrying flow of *dhātu*-s, *mala*-s and *doṣa*-s was reconstituted to a three-dimensional image of the body which does not need to be in harmony with nature. All these taken together, finally, reconstruction of Āyurveda and Indian medical system was done for ever. Not only that, Indian subjectivity, to a great extent expressed through Āyurveda, was also reconstituted.

Āyurveda – Expression of Indian Subjectivity

When the British people faced Indian culture it was not a *tabula rasa.* Indians had their own of seeing the world. They were very much refined, particularly, in some of the most sophisticated disciplines of knowledge like grammar, prosody, philosophy, philology, astronomy and no doubt in Āyurvedic herbal medicine. "From Pāṇini also we can glean technical terms as used in Ayurveda, suggesting that a system of medicine existed in his life time." (Ray, 1903: xxxvi-xxxvii) Again, Āyurveda itself was intensely engaged with philosophical doctrines and, predominantly, influenced by Nyāya-Vaiśeṣika and Saṃkhya systems of philosophy. (Matilal, 1999; Matilal, 1997; Comba, 2001; Larson, 1987; Bruns, 2004; Meindersma, 1993) One important observation in this regard is, "In India, it was grammar, rather than mathematics, that was dominant, and logical theories were influenced by the study of grammar." (Matilal, 1997: 14) Another characteristic of logic recorded in the Caraka, Nyāyasūtra and some other contemporary texts is that it is not a "refutative enthymemes...It only establishes a proposition which happens to be logically contradictory to the thesis of the 'demonstration'." (Matilal, 1997: 3)

Indian people and experts in the field of medicine had also their rudimentary form of surgery as a craft amongst lower castes of the society. In ancient time, they used to practice the means of liberating the obstructed flow of urine. (Zysk, 1998: 70-71) There is also mention of a surgeon in Buddhist text *Mahā*-vagga *of the Vinaya-Piṭaka,* named Ākāśagotto, who made surgical operations (*satthaka-kamma*) on fistula (*bhagandara*). (Dasgupta, 1991: 276) Though, during later period or, more specifically, since 600 A.D. surgery went into complete disuse. Almost similar examples can be had from European medical practice during the middle age. "It is well known that during the Middle Ages the practice of surgery in western Europe was generally regarded as disreputable, and operative surgery was for the most part relegated to the butchers, barbers, bath-keepers, executioners, itinerant herniotomists and occulists..." (Handerson, 1918: 55)

Wujastyk argues, "in spite of Suśruta's elaborate descriptions, there is little evidence to show that these practices persisted beyond time of the composition of Suśruta's *Compendium.*" (Wujastyk, 1998: 106-107) In practice those who applied the surgical techniques seem to have been increasingly isolated from mainstream āyurvedic practice. Even physicians were not in a better position of social acceptability. Manu mentions physicians in the same category as meat-sellers and liquor-vendors,

Yājñavalkya classes them with thieves, prostitutes and others, whose food cannot be taken. (Bose, 1894: 19-20) "The food of a physician is (as vile as) pus, that of an unchaste woman (equal to) semen, that of a usurer (as vile as) ordure, and that of a dealer in weapons (as bad as) dirt." (*Manu Saṃhitā*, 4.220)

In more recent observation it is stated, "Because Ayurveda constitutes a blend of Vedic 'metaphysics' and traditional, pre-modern science it has earned its high place among the learned and intellectually unique accomplishments of Indian civilization." (Fabrega, 2009: 336) Ethnographers argue that the phenomenology of health in Āyurveda, particularly its formulations of person and illness, are culturally distinct from biomedicine (also referred to as modern medicine or allopathy). They note that psychic and somatic components of health, which are isolated from one another in biomedical paradigm, are integrated in the Āyurvedic paradigm. In stead of conceiving the body as solid and bounded (as in biomedicine), Āyurveda conceives the body as fluid and penetrable, engaged in continuous interchange with the social and natural environment. (Langford, 1995) It is a living tradition which has provided (and still providing) healing and physical relief to millions of people across the ages. It has its own explanatory model. Āyurveda literally means "the knowledge (*veda*) of the life span (*āyus*): it teaches how one may utilize the span of life apportioned by nature – traditionally taken to be a hundred years – fully and optimally. It also teaches how to behave in private as well as public life, even how to conduct one's sexual activities. Hence, in many ways Āyurveda represents Indian subjectivity too.

The Indian body image stresses an unremitting interchange taking place with the environment with accompanying ceaseless change within the body. Contrarily, the Western image is of a clearly etched body, sharply differentiated from the rest of the objects in the universe. (Kakar, 1998: 219-251) It is based on unique and specific nature of philosophical explanations and reasonings, the predominant one of which is *tri-doṣa tattva*. *Tri-doṣa tattva* does not need either organ localization of disease or any precise anatomical knowledge, when compared with modern medicine. Nor does it need any physiological explanation (which maps temporal swings within the space of the body) consistent with modern medicine and anatomical knowledge. In its own way *tri-doṣa*

theory explains disease causation, assuming human body (microcosm) to be in harmony with the universe (macrocosm).

Meulenbeld argues that this theory is of post-Vedic origin. "At the time when the saṃhitās of Caraka and Suśruta assumed their present shape, it had definitely begun to dominate āyurvedic theory, but...this process was then still in flux and had not yet come to stand still." (Meulenbeld, 1991: 91) Later commentators enhanced this process. It is perhaps linked with Brahminization of heterodox medical practices to suit to orthodox practice. "Statements that appeared to jeopardize the *tri-doṣavāda* caught the eye of the commentators and gave them much food for thought in their efforts to avert any danger to the prevailing theory." (Meulenbeld, 2008) It has been argued that the reverse may also be true – "brahminic conceptions were changed to fit into the medical point of view." (Benner, 2009)

We can compare some Greek experiences too in this regard. Edelstein, while commenting on "The History of Anatomy in Antiquity", emphasizes, "In general, they explain disease by the humors in the body and by the way these are combined. Such a theory makes it unnecessary to take the internal organs or their form and character into account." (Edelstein, 1994: 266) Āyurveda has been a part and parcel of the culture of India and as such is enmeshed within a very large area of Indian texts. Theories and practices of medicine referred to in non-medical literatures "not only indicate their prevalence and popular impact but also confirm the same described medical texts." (Sharma, 1992)

To sum up:

(1) Had there been no colonial confrontation in India it would be just a conjecture what course could be taken by Āyurveda. Following encounter it has been transformed for ever and never to find any more its original texture and status. It holds good for the Āyurvedic terms too. We can never say now what it actually meant to ancient sages and practitioners.

(2) Construction of medical hegemony occurred through multiple processes – very intricate, intersecting and insidious ones. Some of these processes can be understood and explained, more are in need of better grasp. This process extended from inculcating

European science as the liberating vehicle from ignorance and superstition to making job opportunities by using state machinery to relativizing and trivializing Indian surgical crafts.

(3) Polysemous, context-sensitive and speculative anatomo-patho-physiological and nosological terms of Āyurveda were metonymically reconstituted by circumscribed, context-neutral and *universalized* scientific terms.

(4) Mnemonic verses for organ description were replaced by anatomical atlases and practical dissection. An interesting example in this regard can be had from Ainslie's description – "The present Rajah of Tanjore is a most educated and learned prince, and particularly distinguished by his attachment to scientific research; anxious to make himself acquainted with the structure of the human body, but too rigid a Hindoo to satisfy his curiosity at the expense (sic) of his religious opinions, he ordered a complete skeleton made of ivory to be sent to him from England. The Rajah is, besides, a tolerable chemist..." (Ainslie, 1826, Vol. II: vii) It perhaps epitomizes the basic tension of Indian elite class. They became increasingly avid for modern scientific knowledge of the body, but traditional medical thinking and practices could not provide them with this knowledge. So, they more and more depended on European medical knowledge. Again, religious constraints were hindrance to gaining this knowledge. As a result, both European medicine and 'enlightened' Indian people had to make out some innovative ways to solve this imbroglio. We should remember that the British medical authority was anxiously seeking for proof from 'Shaster' in support of first human dissection in 1836. (Mitra, 1877: 138-139) In their turn, native medical personnel, skilled in modern medical knowledge, served the most urgent needs of the Empire – going out of their institutions to cater to cholera, malaria and other fever and disease-prone areas.

(5) Organ localization of disease gave birth to surgical excellence which, in its truest sense, resulted in marvelous 'speedy efficacy' as avowed by Suśruta. Consequently, prognosis-dependent slow Āyurvedic recovery turned out to be ineffectual. It was admitted that the rule among "the natives of Bengal seems to be to resort to Western systems in the first stages of the diseases, it being the general belief that the ancient Hindu system is slow in giving relief to the sufferer." (Dutt, 1922: iii) It was mainly owing to European surgical excellence. There was no perfect anatomical knowledge in

Indian medicine. As a result, no regular surgical practice was undertaken. Indian physicians, or better to say low-caste people practicing surgery, could perform only some particular types of surgery like couching, lithotomy and rhinoplasty. These surgical procedures were an outcome of regional anatomy knowable through the knowledge of *merman's*. It will be discussed at greater length in the next chapter.

Emergence of *secular social hierarchy* in a positivist, utilitarian milieu generated – (a) awe for new clock-time-based social system, (b) victory of scientific and technical education, and (c) a perpetual sense of 'lack' with respect to the ladder of civilization. Reconstruction of time-space perception > individual patients (*cases*, not *person* per se) in hospital (not domestic) setting > production of *clinical charts* consistent with scientific temporal swings (not seasonal rhythms) occurring inside the body > postmortem dissection to clinch *organ localization* of disease. Now, a sharp dividing line emerged between Indian way of thinking one's self and self-image (and body too) and that of Western medicine – "that the self be not defined too tightly or separated mechanically from the not-self." (Nandy, 1987: 107)

(6) Printing technology relegated manuscript culture of pre-colonial India almost completely to the margin. In European experience in the fifteenth century, it has been estimated that the number of medical manuscripts in the vernacular was six times what it had been in the fourteenth century. In the late-fourteenth and fifteenth centuries, the distinction between medical manuscripts in Latin and medical manuscripts in English was socially significant. (Getz, 1982)

This situation is almost replicated in Indian context where Sanskrit hand-written manuscript culture was completely outwitted and overpowered by English printed books. In mimicry of modern medical textbooks, copious pictures were unhesitatingly reproduced in neo-āyurvedic texts. Interestingly, Sanskrit terms were increasingly employed to locate modern organs. Uprooted in indigenous knowledge systems, healing practices were left with no resource of cognitive and epistemological encounters with the West. The severance of the body's social roots, its dematerialization as a figment of discourse started to build up an entirely new story-in-the-making. "Subversive resistance through hybrid space (and hybrid vocabulary) not only implies (a) a changing native culture but it also indicates (b) the impossibility of generating a sovereign existence

untouched by native culture. The body always exceeds the power frame that attempts to control it." (Bhattacharya, 2004)

(7) Throughout the whole of Āyurveda, to borrow from Wujastyk, "the gaze remains unwaveringly male." (Wujastyk, 1998: 23) A few examples may be cited here. In the famous Bower manuscript one should note that the knowledge of medicine "should not be given to any one who has no son, nor to any one who has no brother; nor should it be taught to any one who has no disciple." (Proceedings, 1893: 62) In *Aṣṭāṅgahṛdayasaṃhitā* – "do not place trust on women or do not give them independence." (*Ah.* Sū. 2.44) In *Carakasaṃhitā – na striyamavajānīta, nātiviśrambhayet, na guhyamanuśrāvayet, nādhikuryāt* / (*CS.* Sū. 8. 22) [Do not ignore women or wife, do not indulge them with over-belief, nor should one confide secrets to them nor should one give them authority.]

(8) As pointed out by Sanjay Subrahmanyam and others, to trace the history of medicine in India efforts must be given "to take the vernacular historiography seriously, and to refine our reading practices, rather than overly depending on normative materials in Sanskrit, or on a prefabricated theoretical schema that derives from a stylized (and impoverished) view of the nature of the transformations produced by colonial rule." (Rao, Shulman and Subrahmnayam, 2007)

I have tried to give an outline picture of the dissertation along which studies will be narrated, documented and made clearer. Rest should be told by the dissertation itself.

Chapter 1

Āyurvedic Knowledge of Anatomy: To Understand Body and Disease

Introduction

I Anatomical Knowledge in Āyurveda

II Place of Surgery in Āyurveda

III Medical Education in Ancient India

Introduction

Men need a theory, for the phenomena that come under observation are so numerous that in default of a theory they would elude our grasp. Medicine must be guided by a theory, for otherwise medical doctrine could not be handed on from teacher to pupil. After these observations Henry Sigerist, the doyen of history of medicine, remarked, "Every theory is philosophical in its nature. It works with the thoughts, with the concepts, available at any particular epoch, thus moulding the culture of the time." (Sigerist, 1958: 15) Cunningham lets us know that the cumulative effect of different 'kinds' of anatomy in Europe led to fostering of "a general belief that detailed anatomical knowledge was the *sine qua non* of a complete medical education, for physicians as well as surgeons." (Cunningham, 1975: 14) In European context, Cunningham traces the 'kinds' of anatomy from 'popular' and 'demonstrative' to 'philosophical' anatomy to modern anatomy. So long as theory and practice, science and practice harmonise, so long as theory derives from practice and, in its turn, guides practice, medical science and practice will be fruitful, as noted by Sigerist. (Sigerist, 1958: 15) Theorization of anatomical knowledge too, following this, depends on available means of a particular period. John Abernethy, a very influential figure of the eighteenth-nineteenth century anatomy and surgery in British medicine, wrote, "There was a time when medical men entertained so determined a dislike to the word *theory* that they could scarcely tolerate the term... When also in the prosecution of our anatomical enquiries, we as it were analyze the body, or reduce it to its elementary parts... we become lost in astonishment that such important ends can be effected by apparently such simple means." (Abernethy, 1814: 9, 15) Theorization was a contested area in French medicine too. Even a person like Rene Laennec (the great inventor of stethoscope in 1816) regarded theories as only aids to

memory. In his course of 1822, he even went so far as to say that only facts constituted science. (Ackerknecht, 1967: 7-33)

Following Alexander's invasion of India the great Roman geographer, philosopher and historian Strabo writes, "There is a class of physicians, according to Megasthenes, among the Germanes (Shramans) who rely most on diet and regimen, and next on external applications, having a great distrust of the effects of more powerful modes of treatment. They are also said to at that early period to have employed charms in aid of their medicines." (Wise, 1860: xiii) He was most likely talking of Āyurvedic practitioners (both Brahmans and Shramans) of that period who believed more on the balance of diet, physical system, and ethico-moral component of a person than on his bodily structure, pathological and anatomical details and organ specific treatment of disease. Medicine can be regarded as the most important of all physical sciences which were cultivated in India. "It was directly and intimately connected with the Sāṃkhya and Vaiśeṣika physics and was probably the *origin* of the logical speculations subsequently." (Dasgupta, 1991) It is also noted, "From the view of history of philosophy the Saṃkhya of Caraka and Pañcaśikha is very important; for it shows a transitional stage of thought between the Upaniṣad ideas and the orthodox Saṃkhya doctrine as represented by Īśvarakṛṣṇa." (Dasgupta, 1991: 219) It becomes evident that the study of medicine was, in another sense, the study of philosophy and *theory of human origin* too. The basic difference between the two is probably centered on application – if in the field of health or not. Indian medicine had in Pāṇini's time already attained a certain degree of cultivation. It appears from the names of various diseases specified by him (iii.3.108, v.2.129 &c), though nothing definite results from this. (Weber, 1892: 266)

It is understood that the study of anatomy was of much importance in ancient Indian medical tradition. Though, to remember, in a diachronic perspective, however, one may safely assume that quite a number of different body concepts were current at the time of the CS's (*Carakasaṃhitā*) composition. (Maas, 2008: 140) In *Carakasaṃhitā* –

Śārīraṃ sarvathā sarvai sarvadā veda yo bhiṣak /

Āyurvedaṃ sa katsarnyena veda lokasukhapradam // (Śārīrasthānam, 6.19) [The physician who is always conversant with the various aspects of the entire body, is the very person who is proficient in the āyurveda which can bring about happiness to the

humankind.] It also teaches us, "Detailed knowledge of the human body is conducive to the well-being of the individual...It is because of this that experts extol the knowledge of the details of the body." (*Carakasamhitā* , Sharma and Dash, 1977, Vol. II: 426) In *Suśrutasaṃhitā* (all the verses have been cited from Trikamji Āchārya's edition. (Achārya, 2008)) –

Pratyakṣato hi yadṛṣṭam śāstradṛṣṭaṇca yadbhavet /

Samāsatastadubhayaṃ bhūyo jnānavivardhnam // [The practical knowledge along with theoretical knowledge is very essential. Whatever is seen while doing practical study and going through Śāstra, adds the knowledge, when both are applied together.] (Śā. 5.48) Again – "The different parts or members of the body as mentioned before including even the skin cannot be correctly described by any one who is not versed in Anatomy...For a thorough knowledge can only be acquired by comparing the accounts given in the Sāstras (books on the subject) by direct personal observation." (Śārīrasthānam, 5.49) (Bishagratna, 1963, Vol. II: 171-172) The place of Śāstra is too important where *text* becomes *authority*. For example, in *CS – nānāryamāśrayet* [Do not take recourse to *anārya*-s (non-Aryans). Su, 8.19]

In *SS*, "The primary position of surgery" is described in this way – "Hear me discourse on the Science of Surgery (Shalya-Tantram) which is the oldest of all the other branches of the Science of Medicine (Āyurveda) and is further corroborated by the four classes of testimonies, viz., Perception, Inference, Analogy and Scriptural Truths (Āgamas). The primary position of this branch of the Āyurveda, (as regards its. time or origin), may be inferred from the fact that Surgery lends her aid materially towards the healing up of traumatic ulcers. The second reason for such an inference may be deduced from the replacement of the severed head of Yajna." (Bhishagratna, 1963, Vol. I: 6-7) To add, "All hold this Tantram to be the most important of all the other branches of medicine... inasmuch as it contains all that can be found in the other branches of the science of medicine as well, with the superior advantage of producing instantaneous effects by means of surgical instruments and appliances. Hence it is the highest in value of all the medical Tantras." (Bhishagratna, Vol. I: 7-8) Hence surgical texts and applications gain an important place following this logic. Moreover acquisition of practical skills and knowledge becomes points of merit for a physician. "A physician,

well versed in the principles of the science of medicine (Āyurveda), but unskillful in his art through want of practice, loses his wit at the bedside of his patient, just as, a coward is at his wit's end to determine what to do when for the first time he finds himself in the ranks of a contending army." (Bhishagratna, Vol. I: 30) Here comparison of an unskillful physician with an army man is interesting to note. Does it indicate anything to have any relationship of ancient Indian surgery with war?

Meulenbeld succinctly summarizes "The Many Faces of Āyurveda." (Meulenbeld, 1995) In his analysis, he views Āyurveda as a gradually evolved Indian medical system. It remains intimately connected with Indian culture as a whole. Of particular importance is the relation of medicine and philosophy in Āyurveda. In his observation, "The *Carakasaṃhitā* and *Suśrutasaṃhitā* contain numerous passages that seem to indicate that philosophical concepts did not fit in well with medical doctrines." (Meulenbeld, 1995: 2) He further adds, "Later, in the age of great commentators... Author, in particular some of them, like Cakrapāṇidatta for example, devoted much energy to the interpretation of the classical texts in agreement with philosophical doctrines that had become authoritative." (Meulenbeld, 1995: 2) He discusses about relationship of medicine, philosophy and religion in Āyurveda and makes brief, yet comprehensive, comparison with the formative period of Greek medicine. To emphasize at this point, this dissertation is not primarily concerned with the philosophical issues in Āyurveda until and unless it is strongly demanded by the course of argument.

Following Meulenbeld's argument we can extrapolate the phases of changes and developments in Āyurveda. (1) Vāgbhaṭa I's (probably 600 A.D.) *Aṣṭāṅgahṛdayasaṃhitā* "heralds a new era of by introducing a consistent system of medicine" and production of texts in elegant Sanskrit verse. (2) systematic and eclectic attempt in Mādhava's system of pathology *Mādhavanidāna* to classify diseases nosologically, (3) sudden appearance of a new branch *Nāḍiśāstra* in Āyurveda in the thirteenth and fourteenth centuries, (4) the inspection of urine *Mūtraparikṣā* becoming more widespread, (5) from 1500 A.D. onwards *Aṣṭasthānaparikṣā* – the eightfold examination – consisting of the examination of pulse, urine, faeces, tongue, voice, skin, eyes, and face or general appearance gradually becoming the norm, (6) the blending of medicine and alchemy becoming conspicuous feature since the times of Cakrapāṇidatta (11th century A.D.) and Vaṅgasena (11th or 12th

century A.D.), and, finally, (7) "the decline of surgery, and, closely bound up with it, of *anatomical knowledge*." (Meulenbeld, 1995: 7) Besides these, there are noticeable influences of Islamic medicine (c.f. a special medicinal preparation *arka*, of Arabic origin from about A.D. 1200) and Western medicine on the system of nosology "The nineteenth century is the age of the revival of Āyurveda and its professionalization." (Meulenbeld, 1995: 10)

Ancient Indian physicians used only drugs, mostly vegetable products, but from around the seventh century metals were used too, especially mercury but also compounds of iron and other minerals. By the thirteenth century the pulse was being examined, and in the sixteenth century an important Āyurvedic healer in Varanasi, Bhavamiśra, identified the new form of syphilis which had been introduced by the Portuguese. Significantly, he called it "the Frank [European] disease," and said it was usually caused by intercourse with Frank women. (Pearson, 1995: 149) Another important point to note here is that the culture of Islam had a definite influence on Āyurveda. The Muslims brought with them their own system of medicine derived from the Greeks. Both systems interacted and borrowed from each other. But despite this fact "Remarkable is the absence of changes in the theory. The borrowings that can be detected are restricted to the practice of medicine." (Meulenbeld, 1995: 8) This is also seen during the 'revivalist' period of Āyurveda. "An ambiguous situation is reflected in the literature of that period. On the one hand one observes a renewed interest in the classical *saṃhitās*, which were repeatedly printed, while, on the other, there was *no break* with the preceding period to be seen in the works compiled or composed in the nineteenth century." (Meulenbeld, 1995: 9)

As discussed earlier, "The large saṃhitas are didactic texts in prose and verse of varied metres. The prose passages generally contain mnemonic verses which summarise them." (Filliozat, 1964: 25) The chapters entirely in verse are specially those that contain the enumeration of symptoms or therapeutic prescriptions. They are, therefore, the ones which it is most useful to know by heart for practicing, whereas the passages in prose generally deal with the theoretical principles. "The choice of prose or verse seems, therefore, to have been dictated chiefly by a pedagogic desire." (Filliozat, 1964: 26) In his 'Foreword' to *Agniveśa's Caraka Saṃhitā* Shiv Sharma possibly warns of this trend,

"Here and there, the author brings a touch of modernity to the ancient text. He describes assembly of Ṛṣis in the Caitraratha forest as a "symposium", and the Ṛṣis themselves as "participants in the symposium..." As a result he has almost bodily lifted the assembly from the beautiful Caitraratha forest and deposited it in a committee room of a modern institution."(Sharma and Dash, 1977, Vol. I) Translators themselves too admits this fact, "There are innumerable difficulties in translating a text into another language, especially so in translating an *Āyurvedic* text." (Sharma and Dash, 1977, Vol. I: xliii) In *CS* it is explicitly stated, "If something, already classified in a particular manner, is reclassified in another way following different criteria, there may be a change in the number of groups, and such a change (as suggested in the previous paragraph) should not render the statement suggesting such a classification incorrect." (Sharma and Dash, 1977, Vol. I: 184) Further, "An individual has the liberty to classify things as he likes...This does not invalidate the number of groups according to some other mode of classification...Thus the term *roga* is synonymous with both the *doṣa* and *vyādhi* (disease)...For the rest like *hetu* (etiology) etc., this term, viz. *roga* carries a different meaning." (Sharma and Dash, 1977, Vol. I: 185) [This particular has been discussed in the previous chapter.] One of such difficult terms (and ideas associated with it) is *doṣa*. Scholars, excepting a few, have consistently translated it as humor (as perceived in Greek medicine, principally by Hippocrates). However, there is a fundamental difference between humor and *doṣa*. In Hippocrates humor stands for juices, "And it appears to me that one ought also to know what diseases arise in man from the powers, and what from the structures. What do I mean by this? By powers, I mean intense and strong juices; and by structures, whatever conformations there are in man." (Adams, 1819, Vol. II: 176) To one scholar, "at Greek medicine, where the four humors (the word used is 'juices' – blood, phlegm, yellow bile, and black bile – play a central role in the texts of Hippocratic corpus (perhaps rather in the younger texts of the corpus)." (Scharfe, 1999: 612) In another authentic translation Hippocrates, "The health of the body depends upon the combination of its various juices." (Jones, 1931, Vol. I: 346) Even scholars like Dominik Wujastyk, Kenneth G. Zysk and Francis Zimmermann often subscribe to this received wisdom. Meulenbeld has kept the term *doṣa* intact in its usage, Filliozat terms it as 'trouble', Scharfe as 'faults', while Rahul P Das has translated *doṣa* as 'morbific entity.' In this dissertation, *doṣa* will

be used as such. What is *doṣa*? Meulenbeld addresses the problem, "The classical treatises on āyurveda are in large measure determined by the doctrine of the *doṣas*, but nevertheless they do not specify which characteristics determine that particular constituent of the body belongs to that group." (Meulenbeld, 1992: 1) Pitman in her comparative study on the conception of wholeness between Greek and Indian medicine notes that 'humor' evidently means any fluid discharge in Greek concept. (Pitman, 2006: 105)

Having addressed the issue of *doṣa* and its comparison with Greek humors we can now proceed to a large number of anatomical as well as physiological terminological problems related to explanations of body mechanisms as faced in Āyurvedic texts. Some of these most used terms are *śirā*, *dhamanī*, *snāyu*, *ojas* and *srotas*. (Wujastyk, 1998: 36-37) As seen in the previous chapter, in ancient India "Anatomical observations, again, were certain to be brought about by the dissection of the victim at the sacrifice, and the dedication of its different parts to different deities... Animal anatomy was evidently thoroughly understood, as each separate part had its own distinctive name." (Weber, 1892: 30) The chapter of the *Amarkośa* (ii.6) on the human body and its diseases certainly presupposes an advanced cultivation of science. (Weber, 1892: 267) Kunjlal Bhishagratna's translation of *SS* exposes the character of fleeting meanings of the term *śirā*. In the section *Śirā-varṇanā-Vibhaktināma Śārīram*, it is translated as 'vessels.' (Bhishagratna, Vol. II: 191) But, while describing 'Principal Śīrās', 'Vāyu-carrying Śīrās' are translated as 'nerves', 'Pitta-carrying Śīrās' as 'veins', and for Kapha it stands as 'lymphatic vessels.' (Bhishagratna, Vol. II: 192) In chapter ix of Śārīrasthānam (*Dhamanī-Vyākarana- Śārīram*) Dhamanīs are termed as 'ducts.' (Bhishagratna, Vol. II: 209) Dhamanī is derived from the root *dham*, to blow. In his footnote, Bhisagratna explains it as "to be filled with air." Why so? He gives his explanatory note – "so called from the fact of their being distended with air after death." (Bhishagratna, Vol. II: 209) [It is curious to note that modern explanation of post-mortem changes were unscrupulously used to explain phenomena of ancient texts. Such explanations, it can be presumed, was altogether unknown to the authors of Āyurvedic texts.] In the same chapter, Dhamanīs were translated as 'arteries' and even 'nerves.' What can be extrapolated from all these and following discussion is that it is the visual representation of that world of discourse

where no concrete human body is taken into account. Text serves as authority in this discourse. We can give an example from an important recent paper by Wujastyk.

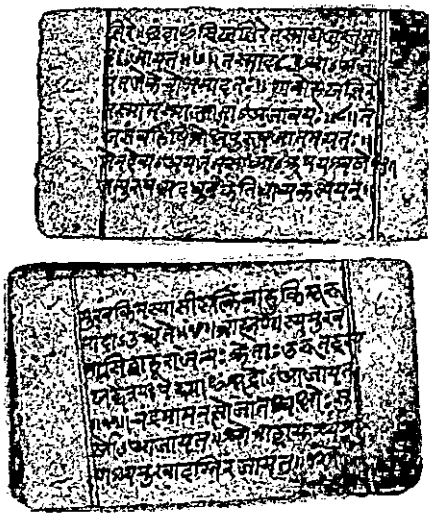


Fig. 6

[The body in text alone: Sanskrit manuscript folio of the *Puruṣasūkta* from the *Ṛgveda* (hymn 10.90), showing verse 11, *yat puruṣaṃ vyadádhuḥ...*, on the sacrificial division. Wellcome MS Indic δ1951. Wellcome Library, London.] (Wujastyk, 2009: 191)

I. Anatomical Knowledge in Āyurveda

In an important scholarly work this problem is taken up in a different way. "**Dhamanī,** 'reed,' appears to denote 'pipe' in a passage of the Rigveda and in a citation appearing in the Nirukta. In the Atharvaveda it denotes, perhaps, 'artery' or 'vein,' or more generally 'intestinal channel,' being coupled in some passages with Hira." (Macdonell and Keith, 1912, Vol. I: 390) Similar connotations are found in *SS* too – "As the stem and leaves etc, of a lotus plant, originated from its bulb, spread over the whole surface of a pool or tank (lit: water), so the vessels emanating from the umbilicus of a man spread over his whole organism." (Bhishagratna, Vol. II: 197) Two points may be noted here – first, just after describing the anatomical ways of making surgical incisions in strict considerations of *marmas*, to be correct *marmans*, (like 'Utkshepa-Marmas', 'Simanta-Marmas' and 'Adhipati-Marma') vessels are compared with a natural creation flower, and, second, vessels are supposed to come out from 'the umbilicus of man'. Both of these have little standing with anatomy if it is understood to be a discipline to primarily understand organ localization. Wujastyk finds that the variety of ancient Indian

body concepts is naturally reflected in a rich Sanskrit vocabulary of names for the body, a litany of which includes such terms as *sarīram, kāyaḥ, dehaḥ, vigrahaḥ, aṅgam, vapus, kalevaram, tanus, gātram, savaḥ* and *kuṇapaḥ*, each carrying its own particular connotations according to usage and etymology. India, then, produced a rich and diverse world of body-discourse all of her own. (Wujastyk, 2009)

Regarding *marman* (vital/lethal spots), as described in Indian medical and non-medical texts, Filliozat notes, "Medicine has not created this element of its anatomical representation; it has received the same from the Vedic tradition in a ready-made form and has only developed it." (Filliozat, 1964: 164) In this connection, Hoernle finds that Vāgbhaṭa, while discussing *marman*, counts "only two ankle-bones and two wrist-bones." (Hoernle, 1994: 95) Otherwise, these figures are eight and four respectively. Elucidation of *marman* in this case results in variation in the number of bodily parts. Another point should be mentioned here. In the *Garbha Upaniṣad*, the vital spots or *marman*-s are counted to be 107 in number. (Dasgupta, 1991: 312-313) It will become evident later that anatomical terms and organs were directly incorporated into Āyurveda largely from non-medical texts. Furthermore, "there are also *marman*-s which are not listed in the usual *marman*-lists..." (Das, 2003: 568) Again, some of the texts like Kāśyapasaṃhitā also regard head heart and bladder as the three principal vital points. (Meulenbeld, 2008a: 488)

Similar confusion arises while explaining the concept of *ojas* in Āyurveda. In *CS* it is described thus – The pure slightly yellowish blood which dwells in the heart is called *ojas*. If it is destroyed, the body perishes. (Sharma and Das, Vol. I: 74) Again, it is said – *ojas* – carrying dhamanīs are extended in all spaces of all animals. It is the *ojas* which keeps all living beings refreshes. There can be no life without *ojas*... But all these action of *ojas* manifest itself in different ways, only with the help of these vessels. (Sharma and Das, Sū. 30.8-9) In Cakrapāṇidatta's redaction, "Actually the body of the foetus does not serve as food for evil spirits who move in nights and live on *ojas*." (Sharma and Das, Sā. 2.10) However, Dash and Sharma explain, "*ojas* is of two types – one is of eight drops in quantity and the other is half *añjali* (48 ml.)." (Sharma and Das, Vol. II: 353) In Suśruta's explanation, "*ojaḥ somātmakam snigdham śuklam śītam sthiram rasam viviktam mṛdu mṛtsnam ca prāṇāyātanamuttamam.*" (Filliozat, 1964: 167) Filliozat

explains, "*ojas* is of nature of Soma, unctuous, white, fresh, substantial, fluid, pure and sweet; it is the principle seat of life." He also notes, "It can be seen that it is not only because of the name that the *ojas* of the medical texts is identified with that whose possession was attributed by the Veda to the warrior Indra." There were also attempts to identify the *ojas* with albumin of modern medicine. However, in *CS* (Sū. 17, 74-75): "That pure (substance) which stays in the heart and is (of a) slightly red (colour), tinged with yellow, is called the vital fluid of the body; by its annihilation a man is annihilated. The vital fluid arises first in the body of bodily beings; it arises with the colour of ghee, the taste of honey and the smell of parched grain." (Meulenbeld, 2008a: 451)

We are again confounded by a problem – what is the character of *ojas*? Is it humoral concept or a physical quantity? It becomes one of the standing puzzles of Indian medicine. Moreover, it may be worthwhile to note that Indian medicine, like other ancient medicines, sees 'flesh' instead of 'muscle' in modern medical sense. It should be added here that it was all 'flesh', not 'muscle', which has been discussed all through ancient Indian texts. Similar problem was found in Greek medicine too. "Plato did not distinguish muscles from flesh, either in terms of structure or function. Nor did he consider that the flesh was in any way involved in movement." (Shanks, 2000: 67; Matuk, 2006) To conceptualize the difference between 'muscle' and 'flesh' is a kind of cognitive leap forward in the history of medicine. Similar problem was noted by Kuriyama too, though, in the context of Japan. In Japan's experience Kuriyama observes, that the essence of changing one's outlook was learning to conceive of the body anatomically. (Kuriyama, 1993) He further stresses, "That perception and attention are intimately related is both a commonplace of academic psychology and a fact of daily experience." (Kuriyama, 1993: 40) Next problematic term to face in reading the Āyurvedic categories is *srota*. It is said – *jāvantaḥ puruṣe mūrtimanto bhāvaviśeṣāstāvanto evāsmin srotasāṃ prakaraviśeṣāḥ* [there are same number of *srotas* in a human body as are the number of the structural entities like *rasa*, *rakta* (blood) etc.] (Sharma and Dash, Vi, 5.3)[1] It is also said, "*srotas* (channels), *sirā* (vein), *dhamani* (artery), *rasāyanī* (lymphatic channel), *rasavāhinī* (capillary), *nāḍī* (duct), *panthā* (passage), *mārga* (track), *śarīrachhidra* (spaces inside the body), *saṃvṛtāsaṃvṛta* (duct

[1] Vi stands for Vimānasthāna.

closed at one end and open at the other), *sthāna* (residence), *āśaya* (container) and *niketa* (abode) – these are the names attributed to various visible and invisible spaces inside the tissue elements of the body." (Sharma and Dash, Vol. II: 177) Dasgupta notes, "It seems to have been recognized that there was a general flow the liquid elements in the body. This probably corresponds to the notion of *srotas*." (Dasgupta, 1991: 291) Interestingly, "Suśruta refers to the Caraka's view that *śirās*, *srotas* and *dhamanis* are the same and opposes it, saying that they are different in appearance, number and functions." (Dasgupta, 1991: 349) We should take care of the terms like appearance, number and function. Appearance can be gauged by anyone, without being an anatomist, seeing the channels in the body. Number happens to be almost always arbitrary in Āyurvedic texts. Regarding function, it is explained in terms of *tri-doṣa* theory. What is not mentioned is the structure of *srotas*. Exact structure of *srotas*, if it could have been determined, would certainly point to anatomical practices in ancient India. *Snāyu* is another problematic term. The general tendency of the Sanskrit scholars is to regard *snāyu* as nerve. But this is contradicted by its etymological derivation from '*snā*' or '*si*' to bind and the Suśruta mentions 210 joints, but does not say anything anywhere else of the binding material that holds them together excepting of 14 '*sīmanta*' at the junction of more than two bones (*saṃghāta*). Furthermore, "it is possible that by '*snāyu*' Charaka and Suśruta meant something entirely different from the ligament and the tendon." (Chakraberty, 1923: 33) An important observation, though arising from a different context, can be cited here. Hopefully, this will help us understand the problem form a different perspective of Western origin but related to same sort of difficulties of connotations of anatomical terms.

Charles Singer notes, "Naked-eye human anatomy employs some five thousand technical terms...For the major parts of the body, and especially the external parts, we use mostly the ordinary colloquial English, terms, Most of these are traceable to Teutonic, and all of them to Indo-European roots; such are leg, thigh, shoulder, belly, breast, heart, lung, liver, bladder. These also are butchers' terms." (Singer, 1957: 1) How this problem was solved? Singer explains, "The Greeks had no classical language from which to draw technical terms. They therefore often made a term technical by giving a colloquial expression a strained sense, thus drawing attention to its special use. Thus, for

example, *pankreas* means simply 'all flesh', a term which might be applied to many other organs." (Singer, 1957: 5) He also reminds us, "It is sometimes forgotten that Greek science endured for longer than has modern science." (Ibid, 5) The same holds good for Āyurveda too. Having kept these problems and particularities in mind next step towards understanding of the human body in Āyurvedic texts can be made. Another observation may be mentioned here, "As Hindu medicine has seldom been able to shake itself completely free from the influence of magic and alchemy as auxiliaries, physicians, as practicers of the "black art," have been given an inferior position in the legal treatises." (Ray, 1903: viii) There was also an assumed underlying division between the 'Dhanvantari sect' (used to practice surgery) and 'Veda-vadī sect' even down to the twentieth century. While the former sect relied more on *āgama* (Vedic principles) as the primary source of reasoning and knowledge, the latter took recourse to *pratyakṣa* (direct apprehension) as their premise of knowledge. (Bhattacharya, 2001)

Āyurvedic terms from non-Āyurvedic sources

"The interest of the Vedic Indians seems early to have been attracted to the consideration of questions connected with the *anatomy* of the body." (Mcdonell and Keith, 1912, Vol. II: 358) A hymn of Atharva Veda enumerates many parts of the body with some approach to accuracy and orderly arrangement. (Bloomfield, 1897) "There are twelve months in the year, and these twelve breathings in man, and these (two) now are one and the same; - there are thirteen months in the (leap-) year, and these thirteen (channels of) breathings in man, the navel being the thirteenth, and these (two) now are one and the same;" (Bloomfield, 1897: 168). Also, "And there are three hundred and sixty nights in the year, and three hundred and sixty bones in man, and these (two) now are one and the same;--there are three hundred and sixty days in the year, and three hundred and sixty parts of marrow in man, and these (two) now are one and the same." (Ibid, 169) Now there must come up questions regarding origin anatomical knowledge in ancient India. It will be found in further discussions that the conception of the human body (or body image) is derived in a huge amount from non-Āyurvedic texts. This knowledge was codified, given some technical applicability to an extent and made to use for healing purposes in Āyurveda. It may now be profitable to search for non- Āyurvedic

texts from which various notions and bony structures and different organs were derived. "We should, therefore, look for the birth of a scientific Āyurveda in the texts which have preceded it." (Filliozat, 31) The reading and explanations of Āyurveda by Filliozat, Meulenbeld, Wujastyk, Zysk, Das, P. V. Sharma and Zimmermann are particularly helpful in understanding specific problems of anatomical knowledge in Āyurveda. He reminds that the number of anatomical terms found in the Vedic Samhitās is quite large. A large number of different parts of the body have each a special name and sometimes several names. Many of these names have passed from Vedic Sanskrit into classical Sanskrit and are consequently met with both in medical texts and in Vedic hymns, because they do not have a strictly technical value and their knowledge has never been limited to savants. Unfortunately, there are no precise anatomical descriptions in the medical books, lesser still the figures. In India, where oral instruction surpasses other forms, anatomy, which can be really learnt best only by direct examination, was certainly taught orally. The books contained only lists to help the memory. We cannot, therefore, always identify an organ, whose name is nevertheless employed both in the Vedic and Ayurvedic texts. Moreover, a certain number of names are found only in the Veda.

Against this perspective some of the most important texts directly contributing to the knowledge of anatomy in Āyurveda can be located. These are *Atharva Veda*, *Śatapatha Brāhmana*, *Śāṅkhāyana Āraṇyaka*, *Maitrāyaṇi Saṃhita*, *Taittiriya Upaniṣad*, *Aitareya Brāhmana*, *Aitareya Āraṇyaka*, *Vishnu Smriti*, *Jājñavalkya Smṛiti*, *Hārīta Saṃhitā* etc. In the above-mentioned *Garbha Upaniṣad*, there is a description of fetal development. In that connection it is told that a body is called *śarīra*, because three fires reside in it (*śrayante*), viz. the *koṣṭhāgni*, *darśanagni* and *jñānāgni*. (Dasgupta, 1991: 313) *Garuḍa Puraṇa* contains treatises on various subjects like astrology, palmistry and precious stones and "one still more extensive on medicine." (Reed, 1891: 374) Some of these texts give a detailed account of bones of a human body, some others provide account of sacrificial rituals and the way bones are collected after cremation. Now the obvious question arises – how bones would be collected if touching a dead body was a social taboo? Some explanatory notes based on texts and extrapolating from them may be forwarded. There is mention of an instrument *pavana* in the Atharvaveda which actually

denotes an instrument for purifying grain from husks, etc. (Mcdonell and Keith, Vol. I: 507)

In *Hārīta Saṃhitā* is told "The rite of depositing bones [should be performed] within the three days after death..." (Dutt, 1906: 217) Similar ritual practice is found in *Vishnu Smriti* too, "On the fourth day they must collect the bones that have been left." (Jolly, 1880: 76) Further, to mention here, is that there were practices of collecting bones of the dead person. This collection of bones must have exposed the Ayurvedic physicians to surface morphology and structure of bones. There is mention of dissection of the sacrificial animals (*paśor vibhakti*). Sṛñjayas and the Kurus are said to have taught Girija Bābhravya the science of this dissection. (Mcdonell and Keith, Vol. I: 376) In *Vishnu Smriti* (*The Institutes of Vishnu*) we find, "43. He must recognize this human frame to consist of seven elements. 44. Those elements are adeps, blood, flesh, serum of flesh, bone, marrow, and semen." (Jolly, 1880: 283) Again, the number of bones is like this "58. There are twenty nails. 59. There are as many bones to the hands and feet (one at the root of each finger and toe). 60. There are sixty joints to the fingers and toes. 61. There are two (bones) to the two heels. 62. There are four to the ankles. 63. There are four to the elbows. 64. There are two to the shanks. 65. There are two to the knees and two to the cheeks. 66. (There are two) to the thighs and (two) to the shoulders. 67. (There are two) to the lower part of the temples, (two) to the palate, and (two) to the hips. 68. There is one bone to the organs of generation. 69. The backbone consists of forty-five (bones). 70. The neck consists of fifteen (bones). 71. The collar-bone consists of one (bone on each side)." (Ibid, 284) Examples can be multiplied. But this brief account makes one understand how the descriptions of bones and other structures of the human body were incorporated into the medical texts. Another relevant issue arises with the question of burial or cremation. According to the customs prescribed by the Sūtras, the bones should be collected after cremation. (Muir, 1868, Vol. V: 316) In *Vedic Index* it is explained, "**Agni-dagdha.** This epithet ('burnt with fire') applies to the dead who were burned on the funeral pyre. This is one of the two normal methods of disposing of the dead, the other being burial (*an-agnidagdhāḥ*, 'not burnt with fire'). The Atharvaveda adds two further modes of disposal to that viz., casting out (*paroptāḥ*), and the exposure of the dead (*uddhitāḥ*)...Burial was clearly not rare in the Rig Vedic period: a whole hymn

describes the ritual attending it." (Vol. I: 8) Another observation may be added here. The well-known distinction drawn in the Rig Veda (x. 15, 14) between *agnidagdha*-s and *anagnidagdha*-s, shows those other forms were known and practiced. "It is not at all impossible that Rig Veda (x. 18.10) originally referred to the rite of burial (Winternitz, Ges. d. ind. Lit. I. 85). The data as to burial are found in the Vedic hymns and especially in the Sutras the Grihya and the Petrimedha and kindred texts and in the records of modern usages. But cremation of the dead was and still is the ordinary practice." (Banerjee, 1920: 200) Some verses of *Atharva-Veda Saṃhitā* accompany the deposit of the collected bone-relics "at the root of a tree." (Whitney, 1905, Vol. II: 838) Another verse is used in connection with gathering up the bones after cremation. (Ibid, 837) There are several enumerations of the parts of the body, not merely of the skeleton, in the Yajurveda Saṃhitās. They include the hair (*lomāni*), skin (*tvac*), flesh (*māṃsa*), bone (*asthi*), marrow (*majjan*), liver (*yakṛt*), lungs (*kloman*), kidneys (*matasne*), gall (*pitta*), entrails (*āntrāṇi*), bowels (*gudaḥ*), spleen (*plīhan*), navel (*nābhi*), etc. (Mcdonell and Keith, 1912, Vol. II: 361) In this connection more may be had from the *Vedic Studies*. The author notes that the fortress of the gods is, as Sāyaṇa explains, the human body; the nine doors are the nine apertures of the body, namely, the two ears, the two eyes, the two nostrils (or according to others, the nose and the *brahma-randhra*), the mouth, the *upastha* and *pāyu*: and the eight wheels are the eight *dhatavah* or elements' of the body *tvac* (skin), *asṛj* (blood), *medas* (fat), *asthin* (bone), *majjan* (marrow), *śukra* (semen), *māṃsa* (flesh), and *ojas*. The sheath of gold within it is the heart, which is the abode of the *atman*. (Venkatasubbaiah, 1932: 169) In this description heart is compared to a "lotus-bud, facing downwards...one span below the neck (that is, below the top of the windpipe), and above the navel." In *Śatapatha Brahmaṇa*, to note, the heart is described as smooth, circular in shape and nearer to the right armpit. (Saha, 1999: 11) The mention of '*pṛṣṭi*' and '*kīkasā*' has also been found in *Śatapatha*. As per commentary of Sāyaṇa *pṛṣṭi* is the normal side-bones of the waist and *kīkasā* is the short side-bones. (Ibid. 13) Filliozat, having taken all these facts into consideration, makes his insightful comment, "The constituents of the body recognised by the Veda are those which Āyurveda has also recognised. The majority comes within the same sense and the notions concerning them are, properly speaking, not anatomical but commonplace." (Filliozat, 164) However,

some of the terms, perhaps many, are commonplace still some others nearer the theoretical conceptions "in Āyurveda is quite characteristic of the role played by the old ideas of the former in the formation of the latter." (Filliozat, 165) One interesting example (which will be elucidated later) can be cited here. Most of the surgical operations in *Suśruta Saṃhitā* are based on based on understanding of *marman* or 'vital/lethal spots' for easier understanding. These points should be understood as a junction or meeting place of the five organic principles of ligaments, veins, muscles, bones and joints. There are one hundred and seven *marmans*. Heart, head and *basti* (urinary bladder) are known as 'trimarma' because of their importance. Filliozat observes that Rig Veda employs this mostly in the reference to the killing of Vṛtra by god Indra. "The form is derived from the root *mṛ*, "to die", and it means above all a "mortal point."" (Filliozat, 164) The Āyurvedic texts have an extremely detailed catalogue of the marmans and they are, in general, quite easily identifiable, thanks to the precisions that are furnished. "They are most often the big vasculo-nervous packets or the tendons and the important nervous trunks." (Filliozat, 164) From all these facts it follows that the anatomy of the classical texts of medicine is, as far as the notions on the various canals and vessels or other organs of the body are concerned, a direct descendant of the Veda.

II Place of Surgery in Āyurveda

Anatomical organs in Āyurvedic texts

While writing in a European context Roger French traces the modes of acquisition of anatomical knowledge in ancient times "We may list the indirect ways of learning about the internal structure of man as follows: (1) analogy with animals; (2) inferences from the externally visible structures of man; (3) from natural philosophy as a whole; and (4) from function." (French, 1978: 10) Except natural philosophy which did not develop in ancient India the other modes of knowledge acquisition may be compared that in India. For a better understanding of the nature of medicinal knowledge in Āyurveda, it should be scrutinized what were the constitutive elements involved in the mechanisms of formation of this knowledge. Arguably, these may be derived from four sources – (1) knowledge of the herbs, (Das, 2001; Dey, 1896; Sharma, 1992a and 1992b; Whitney, 2002) (2) philosophical knowledge applied to the particular discipline of medicine,

(Dasgupta, 1991; Larson, 1987) (3) knowledge of religion and divinity, (Zysk, 2000a)[2] and (4) knowledge of the body proper. Regarding the last point Zimmermann comments, "Finally, in the analysis of the human body, two points of view are superimposed, one on the other." (Zimmermann, 1999: 169) Form the point of view of the 'materials of movement,' the humors are fluids irrigate the tissues. From the second point of view of health and disease, "they represent various facets in the combinative system of humors, savors, and qualities." (Zimmermann, 1999: 169) As a result, "the description makes it impossible to determine any anatomical locations with any precision." (Ibid, 166) Our following discussion will elucidate these questions. As we have seen in the *Institutes of Vishnu,* there is detailed enumeration of organs and bony structures of the human body. (Jolly, 1880: 283-287) Incorporation of this knowledge of anatomy in Indian medical texts is perhaps better understood by Edelstein's study in *Ancient Medicine*, "The value of a tradition can only be judged through a historical understanding of the time from which it derives and for which it is valid." (Edelstein, 1987: 249) Again, "Certainly knowledge of the body in antiquity is to be found not only among physicians, but also among philosophers and natural scientists... In antiquity, knowledge of the body is never exclusively professional knowledge, as it is now." (Edelstein, 1987: 260-261) Zysk, taking his cue from Edelstein, suggests that anatomical knowledge can be obtained in three ways: sacrifice, chance observation and dissection. Regarding anatomical knowledge in ancient Indian medicine, he has focused "on the methods by which this specialized knowledge was ascertained." (Zysk, 1986; Bhishagratna, Vol. I: vii-ix) The quartered animals at the Vedic sacrifices afforded excellent materials for the framing of a comparative anatomy. (*Aitareya Brāhmaṇa*, I. 2, II. 12, III. 37) "Sushruta devoted his whole life to the pursuit of surgery proper, to which he brought a mind stored with luminous analogies from the lower animals." (Bhishagratna, Vol. I: xv-xvi) Though Zysk admits, "the most impressive aspect of the earliest phase of anatomical knowledge is precision with which the lists of anatomical terms were recorded." (Zysk, 1986: 697) He also finds that the correspondence between "the underlying medical philosophies in the

---

[2] *trividhamauṣadhamiti - daivabyāpāśrayaṃ, juktivyapāśrayaṃ sattāvavajayasca* [Therapies are of three kinds, viz., spiritual therapy, therapy based on reasoning (physical property) and psychic therapy.] *Carakasaṃhitā*, Sū, XI.54

teaching of Suśruta and in those of the Greek scientists and anatomists point to a Hellenistic origin of dissection in India." (Zysk, 1986: 694) While concluding with a critical translation of chapter five on the "enumeration and distinction of the bodily parts" in the book of anatomy of the *Suśruta Saṃhitā* he comments, "there is a definite lack of knowledge concerning the structure of the body which lies beneath the rib-cage. This has continued to the time of Ḍalhana (12th cent. A.D). The anatomists saw the tubes (trachea and oesophagus) descending into the lungs and assumed that one went to the lungs and the other to the heart." (Zysk, 1986: 702) In another insightful observation, "the heart-cavity (*guha*) is said again and again to be the dwelling place of the Atman or Puruṣa, variously described..." (Ewing, 1901: 265) The heart cavity does not find any anatomical position (in modern sense) within the body. It seems to be involved with Atman or Puruṣa which are not any concern for an anatomist. Zysk, in another paper, notes, "Ancient Indians identified organs resembling lungs (*pupphusa*, *kloman*) as part of human and animal anatomy, but they never understood their function in respiration." (Zysk, 1993: 198) Ancient Indians conceived of the lungs to be the locus of phlegm, and usually to be the seat of vital breath. The most important point to note here that whatever may be the amount of knowledge of surface anatomy and regional anatomy (based on *marman*-s), anatomical knowledge does not correspond with physiological activities. Both, to talk in a bit harsher note, are located in a *speculative cognition.*

It may, however, be argued that – (A) Āyurveda does not have any loan word from the Greek, so the question of Hellenistic origin of Āyurveda does not probably arise – "Indian physicians almost certainly had the opportunity to imbibe Greek medical ideas but apparently no motive" (Wujastyk, 2003: 396), (B) in Indian context, sacrificial practices of animal, which will be detailed later, possibly played the key role in the accumulation of anatomical knowledge (not chance observation or dissection as found in Greek practice), and (C) the two humoral theories of the Greek and Indians respectively seem to be distinctly different at their core and perception. Interestingly, a curious reference to the bones of the is found in *Caraka Saṃhitā*, "a patient is to be examined with reference to *saṃhanana* or compactness of the body...A compact body is characterized by the symmetrical and well divided bones, well-knit joints and well-bound muscles and blood. An individual having a compact body is very strong; otherwise he is

weak." (Sharma and Dash, Vol. II: 271) It is possibly conceivable that here the perception of body is compatible more with aesthetics of the body than with a medical body.

One more point may be brought to our notice. In *SS*, after instructing on the preparation of dead body and dissection to acquire proper knowledge of human body for surgery and treatment, the 5th chapter ends with – *śarīre caiva śāstre ca dṛṣṭārthaḥ syadviśāradaḥ // dṛṭaśrutabhyāṃ sandehamavāpohya caret kriyāḥ //* (Śā, 5.51) ["The vibhu (ātman), being extremely subtle, cannot be perceived with (normal) eyes, but only by means of (the sight acquired through) spiritual knowledge (jñāna) and penance (tapas) (5.50). An expert is one who has acquired practical and theoretical knowledge of the body; practice should be started after clearing away all doubts by seeing and hearing (5.51)." (Meulenbeld, HIML, IA: 253-254)]

Religious authority and its connotations are intertwined at the end with practical procedures of anatomical practices.

In his introduction to *Sushruta Samhita* Bhishagratna comments, "Suśruta recommends dissection on dead human bodies and suggests that it is only required of those who will practice surgery and that students of medicine can do without it." (Bishagratna, Vol. II: vi) He continues, "Suśruta's *Avagharshana* (the procedure enumerated in *Suśruta Samhitā*) is now considered by many as the only perfect mode of dissection ever known." *Avagharshaṇa* is a purely Indian procedure, although it has been sometimes compared with *hydrotomie* practiced by Lacauchie. (Mazars, 2006: 29)

Similar examples of preparing a dead body for anatomical dissection may be found in European experience too, "...the running water which cleaned the body as it disintegrated and the small creatures it contained which fed on it, seem to have played an essential part. The whole process is completed within a short time...Immersion in stagnant water, on the other hand, is followed by very gradual change..." (Kellett, 1964)[3] Nevertheless, needless to say, such procedures could only produce skeleton, bones, tendons and muscles before a naked eye. It was not possible to get into the interiors of the

[3] Detailed description of preparing a dead body through immersing in water will be found in J. L. Casper, *Handbook of Forensic Medicine, based upon personal experience*, trans. George William Balfour, Vol. II (London: New Sydenham Society, 1861), 261-265.

body and gain knowledge about visceral anatomy. King and Meehan comment in a different context, "ancient study of disease did not stress the solid organs, anatomical structure, or the changes therein." (King and Meehan, 1973: 517) As a result, "The association of clinical data and anatomical findings simply made no special impression... The time was not ripe for such an association." (Ibid, 527) Accurate localization of an organ inside the body was usually anomalous in ancient anatomical perception. Bhishagratna too does not fail to note anomalies in Suśruta, "To call it Descriptive Anatomy or Physiology is simply ridiculous. The *absence* of any reference to brain and spinal cord, to pancreas and heart, in a book of Anatomy and Physiology is unpardonable and in the Sārira-sthāṇa we feel this absence almost to *despondency*." (Bishagratna, Vol. II: iii) Regarding disease diagnosis in ancient Greek medicine, Ludwig Edelstein comments in a somewhat similar way, "In general, they explain disease by the humors in the body and by the way these are combined. Such a theory makes it unnecessary to take the internal organs or their form and character into account." (Edelstein, 1987: 266)

Let us now examine the section *Śārīrastahāna* in *Suśruta Saṃhitā* (SS). Among 120 chapters, 46 chapters are in the part of Definitive Aphorisms (*Sūtrasthānam*); 16 in the part dealing with the Etiology of diseases (*Nidānam*); 10 in explaining the Anatomy and physiology of the human body (*Śārīrasthānam*); 40 for Therapeutics (*Cikitsitam*); and 8 in the part dealing with poisons and their antidotes (*Kalpasthānam*). In addition to these, the *Uttara-Tantram* consists of 66 chapters. Amongst these 186 chapters, only a part of chapter V is devoted to the study of dissection and that too only how to prepare a dead body for dissection.[4] It is taught "A pupil, otherwise well read, but uninitiated into the practice (of medicine or surgery) is not competent to take in hand the medical or Surgical treatment of a disease." (Bhishagratna, Vol. I: 71)

Practical surgery "should be taught by making cuts in the body of a Pushpaphala (*Benincasa cerifera* a kind of gourd), Alāvu (*Lagenaria vulgaris*), watermelon (*Citrullis lanatus*), cucumber (*Cucumis sativus*), or Ervāruka (*Cucumis melo*)"[5] and not only that

---

[4] Julius Jolly (1977) comments, "Some sort of dissection is mentioned only in *Sū., 3.5*...Since this procedure is recommended only to the surgeon, the anatomical knowledge thus received may not obviously be considered as necessary for the treatment of cases of other than surgical one." 55.

[5] For scientific names used here see, *Suśruta Saṃhitā*, ed., P. Ray, H. N. Gupta and Mira Roy, 1993, 85.

"The art of venesection (Vedhya) should be taught on the vein of a dead animal, or with the help of a lotus stem. The art of probing and stuffing should be taught on worm (Ghuna) eaten wood, or on the reed of a bamboo, or on the mouth of a dried Ālāvu (gourd). The art of extracting should be taught by withdrawing seeds from the kernel of a Vimbi, Vilva or Jack fruit, as well as by extracting teeth from the jaws of a dead animal." (Bishagratna, Vol. I: 71-72) Finally, this particular knowledge is applied in surgery only in terms of *marman*. Actual surgical practices are nowhere mentioned or described.

Before our conclusion is drawn, we should be aware of some other important features of SS. Importance of surgery is expressed thus – "It is pre-eminent too on account of its quick action, owing to the use of sharp and blunt instruments (śastra, yantra), caustic (kṣāra), and cautery (agni). [SS. Sū, 1.17-18] (Meulenbeld, IA: 203)

The crucial problem arises with a mnemonic verse of śārīrasthāna (5.46) –

tvakparyantasya dehasya yohyam aṅgaviniścayaḥ //

śalyajñānādṛte naiṣavarṇyatehaṅgeṣu keṣucit //

Every one from Hoernle to Meulenbeld has translated this passage as containing knowledge about the body, i.e., anatomical knowledge. Here, the basic problem erupts with the term *śalyajñānād*. Usually, this term is accepted for anatomical knowledge. Only exception is Fiser and Fiserova's article. (Fiser and Fiserova, 1963) *Śalya* actually means "a dart...shaft (also the point of an arrow or spear and its socket), anything tormenting or causing pain...or (in med.) any extraneous substance lodged in the body and causing pain...and, as a branch of medicine, to 'the extraction of splinters or extraneous substances'...." (Monier-Wiliams, 2002: 1059) In Apte's dictionary, the fifth meaning of *śalya* is "Any extraneous substance lodged in the body and giving it very great pain." (Apte, 1985) All these meanings are relevant for a surgeon (*śalyahartar*) in India. To some authors, "It may as well be added that they (surgeons) were perfectly acquainted with the anatomy of the goat, sheep, horse, and other animals used in their sacrifices. Early warfare was conducted with *such weapons as bow and arrow*, sword, mace, etc.Thus in every war the services of bold and skilful surgeons were always in requisition for extracting arrows, amputating limbs, arresting haemorrhage, and dressing wounds." (Sinh Jee, 1896: 179-180) Kunte observed, "surgeons...extracted the shafts of arrows lodged in the body and dressed wounds which the ancient Āryas dreaded much,

because, before they went to war, they donned coats of mail, cuirasses and helmets." (Kunte, 1902: 4)

Now it may be prudent to remember Edelstein, "In antiquity, knowledge of the body is never exclusively professional knowledge, as it is now." The next mnemonic verse of *śārīrasthāna* (5.47-48) sheds light on "certain (niḥsaṃśaya) knowledge" of anatomy. Meulenbeld translates the passage, "A surgeon (śalyahartar), who wants to acquire certain anatomical knowledge, should, with that in mind, thoroughly examine a dead body, after cleansing it, for increase of knowledge arises from the combination of perception (pratyakṣa) and study of the science." (Meulenbeld, IA: 253) The verse is –

tasmānniḥsaṃśayaṃ jñānaṃ hartrā śalyasya vāñchatā //
śodhayitvā mṛtaṃ samyagdraṣṭavyohaṅga viniścayaḥ // (47)
pratyakṣato hi yadṛṣṭaṃ śāstradṛṣṭaṃ ca yadbhavet //
samāsatastadubhayaṃ bhūyo jñānavivardhanam // (48)

Here too remains the problem of translation. In Fiser and Fiserova's translation, "Therefore, anyone who strives after acquiring a safe knowledge of *śalya*, must prepare a dead body, and examine its parts in the right way." (Fiser and Fiserova, 1963: 313) We have seen before that *śalya* should not be confounded with anatomy. This term is more concerned with surgery. Moreover, Hoernle provides us with a *varia lectio* in Bodleian MS., No. 739 and India Office MS., No. 1842. The variant reading is – *icchatā śalya-jīvinā*, instead of *śalyasya vāñchatā*. (Hoernle, 1994: 225-226) It clearly denotes a physician "who lives on surgery" (*śalya-jīvinā*).

Zysk points out to the fact that "a violation of the dead person's sacredness seems purposely to be avoided that rather than cutting into the corpse with a scalpel (śastra)... Suśruta instructs that practice should be carried out on fruits, gourd skin, water-bags, stalks of plants and the like." (Zysk, 1983: 188) It makes us aware of the presence of a surgeon, not an anatomist. If this is the situation, we have to confront and resolve a few questions – (a) how this knowledge of *śalya* was practiced, (b) without having knowledge of anatomy how ancient physicians or surgeons managed to do surgery, and (c) how it came to an end.

After the mnemonic verses, the next part of *śārīrasthāna* is composed in prose. In ancient medical texts, mnemonic verses were written for memorizing theory, while

practical lessons were written in prose. In the next prose section there is thorough discussion on how to prepare a dead body for dissection – "For this purpose, a corpse should be selected which is intact, originating from a person who has not died from poison, has not suffered from a disease for a long time, and has not lived until a very old age. [The text has *avarṣaśatika*, i.e., one who has not attained the maximum span of life of hundred years.] (Meulenbeld, IB: 375, note 151) The corpse, with the intestines and their contents removed, should be wrapped in coverings of muñja grass, bark, kuśa grass, śana (hemp), or any other suitable material, and placed in a running stream, kept within a cage (pañjara), at a place where it is not easily noticed; it should be left there in order to decompose; then, after seven days, one should take it for examination, very gradually scrapping away all the tissues, beginning with skin, and, subsequently, the major and minor external and internal parts of the body which have been mentioned; the scrapping away should be carried out by means of a brush (kūrca), made of uśīra grass, animal hairs (bāla), veṇu (bamboo), balbaja grass, or any other suitable material. (5.49)" (Meulenbeld, IA: 253)

This particular procedure, termed as *avagharṣaṇa*, has been discussed earlier. Rahul P. Das cites reference from later texts on the particular procedure of *avgharṣaṇa* in later Āyurvedic text of Vāgbhaṭa. (Das, 1983) Curiously enough, it may be mentioned that there was the use of black ants whose mandibles serve as staples for suturing a wound. (Mazars, 2006: 70-71) What is missing in this entire discussion is the use of any knife. The described way of treatment without the use of a knife by a simple scrubbing with a whisk made of the roots of *Andropogon muricatus* (uśīra grass). Fiser and Fiserova note, "there is no other instance of a dissection without knife, known so far." (Fiser and Fiserova, 1963: 316) However, in sūtrasthāna of Suśrutasamhitā there are mentions of *śastra*-s and *yantra*-s. (Sū, 1.7 and 1.8) Various types of knives are described there. For our present purpose, we are concerned with the use of knife only in case of dissection.

Now, the relevant question comes up – what could the ancient Indian physicians and surgeons actually observe by employing the described method of dissection? We have some plausible answers – (1) this kind of examination of human bodies provides the dissecting surgeon with some amount of rough information on soft tissues, and (2) he could possibly examine the tendons, ligaments, vessels muscles etc. wherefrom he could

be able to get an idea of their course. "Nevertheless, he could not distinguish them from each other, and estimate their physiological functions; he merely learned that *these structures are not to be damaged in the course of an operation.*" (Fiser and Fiserova, 1963: 321) Here remains an answer to our previous question – without having the knowledge of anatomy how the ancient physicians or surgeons managed to do surgery. It was done with aid of the knowledge of *marmans* – having been discussed before and, also, in the following part. Such sort of surgical dexterity was palpably present even during the colonial period in India as we have seen in our Introduction.

Coming to this conclusion the entire knowledge of practical dissection and surgical practices seems to be ephemeral. It remains no longer a textbook of surgical guidance. Surgical guidance is replaced by the knowledge of regional anatomy. "Surgical operations demanded a knowledge of regional anatomy rather than elaborate and often unnecessary and tedious descriptions of all the structures of the body. The place of regional anatomy was supplied by the concepts of *marmas*." (Kutumbiah, 1999: 33) Moreover, Suśruta's *marman*-theory seems to be a synthesis of different and partly overlapping systematic and anatomical concepts, among which the theory of bodily constituents as the most comprehensive one became the model for *marman*-theory. (Maas, 2008: 142)

Now we can try to address the question of decline of surgery in India. Zysk has convincingly argued about Hinduization and Brahminization of Indian medicine. (Zysk, 2000a) Chattopadhyaya also provides some insights into this issue. (Chattopadhyaya, 1977) One of the most authoritative Brahminic text the *Manu Saṃhitā* (Laws of Manu) states, "The food of a physician is (as vile as) pus, that of an unchaste woman (equal to) semen, that of a usurer (as vile as) ordure, and that of a dealer in weapons (as bad as) dirt. (4.220)" Engler argues, "Ayurveda simply does not manifest characteristics of modern science in anything more than a vague analogous sense." (Engler, 2003)

Interestingly, after the full discussion on how to prepare a dead body for medical knowledge and training we find in *śārīrasthāna* (5.50) –

na śakyascakṣuṣā draṣṭuṃ dehe sūkṣatamo vibhuḥ /

dṛśyate jñānacakṣurbhistapaścakṣurbhireva ca // [The vibhu (ātman), being extremely subtle, cannot be perceived with (normal) eyes, but only by means of (the sight acquired through) spiritual knowledge (jñāna) and penance (tapas).]

Zysk finds Suśruta "Speaking in terms of Vedānta (as interpreted by the 14th cent. commentator Ḍalhana)" and "exposing the internal parts of the human body will never reveal (or harm) the inner soul or self (Ātman) whose correct understanding is gained rather from the religious practices pertaining to sacred knowledge and from ascetism." zysk, 1983: 188) Vibhu is Ātman, the spiritual self of Vedānta. While discussing elements of ritual practices in Vāgbhaṭa's text, Benner finds "It is therefore not always possible to clearly and sharply distinguish ritual and medicine." (Benner, 2009) To describe the characteristics of an individual (because Āyurveda "suggests a purely male view of the body") the Sāṃkhya system of philosophy is invoked for the creation of a man out of assimilation of Puruṣa and Prakṛti. (Wujastyk, 1998: 5)

With the above-mentioned passage in mind, it is understandable that spiritual knowledge finally overshadows the craft of dissection. Embedded within such a social milieu in ancient India, surgical practice was relentlessly relegated to the margins and to the low-caste people like barber potter etc. High caste physicians would only practice textual and scriptural medicine, without ever touching the body. Truly speaking, there is not single conception of the body in Indian medicine (Āyurveda), but a dominant one. When a physician would examine a patient, he would go on reciting mnemonic verses related to the bodily organs. As a result, it appeared that there was no break. In this unique situation, anatomical knowledge seems to have been continuing since time immemorial. With this conception of the body and a unique theory of causation of disease there was no need of dissection at all.

Let us now examine the etiopathogenetic process of a disease as conceived in Āyurveda. In Āyurveda, prodromes (*pūrvarūpa*) develop into full-fledged symptoms (*rūpa*). Secondary affections (*upadrava*) are consequences of the basic morbid process. At the end of this process, recovery takes place or fatal signs (*ariṣṭa*) appear, foreboding death. Each stage is characterized by a cluster of signs. In many cases, the enumeration of these signs occurs in the form of verses, more easy to remember than statements in prose. (Meulenbeld, 2008a: 612-613) According to Sharma, the entire process of pathogenesis

occurs through the following six stages: 1. Sañcaya (accumulation), 2. Prakopa (aggarvation), 3. Prasara (dissemination), 4. Sthānasaṃśraya (localization), 5. Vyakti (manifestation) and 6. Bheda (explosion). It is easily understandable that in this explanatory model of disease causation there is no need of anatomical knowledge or dissecting a body. It emanates from an entirely different conceptual framework. (Sharma, 1998: liii-lv)

Illustration of the now famous 'Āyurvedic man' may help us to clarify the issue. We shall find in this illustration a 'body frame' (i.e. two-dimensional body) without any depth or volume or accurate localization of the internal organs (i.e. three-dimensional body) of modern anatomical knowledge. Wujastyk observes that the body to which Indian medicine addresses itself is the physical body as understood to the senses and to empirical examination. (Wujastyk, 2003) There is another point worthy of mention. Though there are descriptions of bones and various organs inside the body their positions and functions are always described with respect to humoral pathology of the body. Even when Suśruta gives description of any operative procedure he does it with the aid of *marman* points – not any bony reference. For example, "An incision should be made at the spot of a finger's width remote from the Urvi, Kurcha-Śirā, Vitapa, Kaksha and a Pārśva-Marma..." (Bhishagratna, Vol. II: 187)

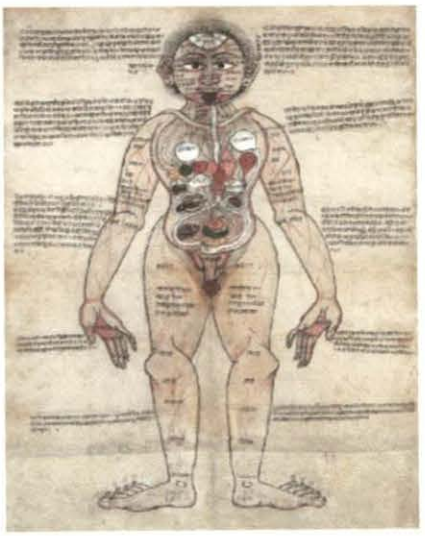


Fig. 7

[This image is entirely drawn from the Āyurvedic understanding of the human anatomy, unlike other Indian images of the human body. The channels and organs drawn on the

torso are specified as in Āyurvedic literature, with organs named as receptacles for one or other of the organic fluids. However, the organs in Āyurveda are seen in a much wider context than in the West. They are the seats of the humors (wind, bile and phlegm) and do not generally engage in the kind of processing which modern western biomedicine expects of an "organ"[6]. Nepalese; c.18th/early 19th century.

Courtesy: Wellcome Library no. 574912i. (Image no. V36133 or L17592)]

Wujastyk has recently critically studies this illustration. (Wujastyk, 2008) We find astonishingly accurate account of the bony details in āyurvedic anatomy, but lack of details and anatomical localization of the organs inside the body. *Śārṅgadharasaṃhitā* (ca. 1300) gives a standardized and clearly presented version of anatomical organs. It enumerates: 7 receptacles, 7 body tissues, 7 impurities of the body tissues, 7 membranes, 900 sinews, 210 ligaments, 300 bones (as against 206 bones in actual estimate the number of bones varies between Caraka and Suśruta being 360 and 300 respectively), 107 lethal points, 700 ducts, 24 pipes, 500 muscles (21 extra ones for women), 16 tendons, 10 orifices of the male body, 13 orifices of the female body. (Wujastyk, 1998: 319) In another study there are 90 tendons. (Rao, 1968) We must note that these are all gross structures that can be observed, accurately or inaccurately, with superficial, yet keen, observation by the unaided eye. In case of a more minute and deeper observation Caraka stressed on the difficulty to correctly count the number of minute parts of the body, "the parts of the body cannot, however be counted because they are divided into tiny atoms (*paramāṇu*), and these are too numerous, too minute, and beyond perception." (Nag, 1994, Vol. II: 269; Wujastyk, 2003) Caraka counts 14 bones in the breast, as Indian anatomists counted cartilages as new bones. While in Suśruta and Vāgbhata I, the same curiously stands to be 8. The windpipe too is regarded as a bone. (Dasgupta, 1991: 286) The Indian anatomists followed a novel method in their count of ribs. The costal cartilages were counted as separate bones.

According to Hoernle, Suśruta's list of bones can be compared with that of Caraka along five points – (a) The Principle of Position, (b) The Principle of Homology, (c) Alteration of Terms, (d) Alteration of Items, and (e) Alteration respecting Structures. (Hoernle, 1994: 72-74) Occasionally nerves and muscles were confused with ligaments.

---

[6] For a comparative study of the 'Āyurvedic man' with the anatomical body, see, Bhattacharya, 2008.

The standing puzzle of Indian anatomy and physiology is the classification of *śirās*, *dhamanīs* and *srotas*. "All subsequent attempts at clearing up this puzzle have resulted in greater confusion. The chief difficulty lies in the fact that every writer on the subject approaches the problem with preconceived ideas and tries to read his own vies into the ancient texts." (Kutimbiah, 1999: 27)

It is known that there are differences in counting the number of bones in a human body between Caraka and Suśruta. While Caraka counts it to be 360, in Suśruta's estimation it comes to be 300. Interestingly, Caraka's number corresponds to the number of days and nights in a year - "And there are three hundred and sixty nights in the year, and three hundred and sixty bones in man, and these (two) now are one and the same..." (Eggeling, 1900) Hence, it may not be an oversight that the method of counting bones and organs in Caraka possibly is more at compliance with season and months than true dissection and observation of dead bodies. In works like Śārira Padmini and Bhāva Prakāśa, the number of bones comes to be 300. (Hoernle, 1994: 90) Vāgbhaṭa I does not have his own ways of counting. Rather, he puts his efforts to combine both the systems, sometimes, in a curious way. It may be worthwhile to have an understanding of *añgas* (parts) and *pratyañgas* (sub-parts) of the body from *Caraka Saṃhitā*. Among all of the organs "The site of consciousness is only one, viz. the heart... In the six *añgas* (parts) of the body there are about 56 *pratyañgas* (sub-parts)." (Sharma and Dash, Vol. II: 545-455) Further, beyond what is described above can be ascertained only from inference only – *snāyu* 900, *śirā 700*, *dhamanī* 200, *peśī* (flesh), *marma* (lethal/vital parts in the body) 107, *sandhis* (joints) 200 in number. [The terminal openings (mukhāgra) of the minute branches of śirās and dhamanīs, as well as the hairs of scalp, face and body are 29, 956 in number (7.14). (Meulenbeld, IA: 45)] To emphasize, Caraka differentiates between 'gross bodily matters' and 'body images.' Solid matters like nails, bones, teeth, flesh, skin etc. Beyond these remain apertures of the body and big and small *srotas* which can only be sensed. *Manas* (mind) and *buddhi* (intellect) are included among body images. "The view that the composite body is one which leads to attachment (saṅga), the insight that its parts are separate to final emancipation (apavarga)." (Meulenbeld, IA: 46)

Another point related to the specific location and function of an organ may be illustrated here. "Ancient Indians identified organs resembling lungs (*pupphusa*, *kloman*)

as part of human and animal anatomy, but they never understood their function in respiration. They conceived the lungs to be the locus of phlegm, and usually the heart to be the seat of vital breath." (Zysk, 1993: 198) This analysis reminds us again of the anomalies between location and function of a particular organ in Āyurvedic texts. Again, breath or *vāyu* or *prāṇa* has very old Rig-Vedic origin and it "stands side by side with *jīvana*..." (Ewing, 1901: 250)

From these ongoing discussions it may be possibly extrapolated that the body Āyurveda is constructed not as a material body (as in modern medicine), but as combinations and dissociations of many body images. This is a bodily frame through which saps and humors – *doṣa*-s, *dhātu*-s and *mala*-s – flow. But as a result of primarily observing the body parts of sacrificial animals and collecting human bones after cremation on the one hand, and, possibly, the buried bodies of the children below 2 years of age, wounded bodies in wars and maybe dissecting bodies in some exceptional cases bodily organs were listed, bones were described and pupils were taught to learn the knowledge of medicine. Even with insufficient and deficient anatomical knowledge the description of the body was essential because human being – the central figure of this beautiful world – was in need of treatment.

When comparing with Greek medicine, "One must, however, realize in what respect the physician's concern with the body differs from the concern of the philosophers and natural scientists and from the general knowledge of these things." (Edelstein, 1987: 261) Indian medicine has borrowed from various philosophical schools, but these philosophical doctrines have been reconstituted according to the need of healing practices. Despite this fact, and bereft of in-depth study of anatomy, it appears that many a time this healing tradition is again lost into philosophical debates not so relevant to the understanding of the 'gross body' or *sthula śarīra*. It will be evident from the following observation of Caraka, "Minutest units (cells?) into which all organs are known as *paramāṇus* and they cannot be counted because (1) they are extremely numerous (2) they are extremely subtle and (3) they are beyond sensory perception. *Vāyu* and the specific nature of the results of the past action associated with these *paramāṇus* are responsible are responsible for their union and disjunction." (Sharma and Dash, Vol. II: 461) It becomes perhaps evident that old authors are not talking about atoms or *paramāṇus* in

modern sense on the one hand, and, on the other, for obvious reasons, there cannot be any clear understanding of what these *paramāṇus* are. Consequently, failing to explain the interiors of the body and its functions thereby they are taking recourse to some philosophical puzzles, at least attributed on the old texts by their commentators, and redactors as suggested by Meulenbeld, Debiprasad Chattopadhyaya and others. Zimmermann brings to our notice, "we, as the heirs of Greco-Latin logic, proceed by way of description and argument; each heading announces the account of a particular line of research. Osteo-logy, physio-logy, patho-logy: the suffix itself indicates an objective approach, a distinction drawn on principle between researcher and his field of study." (Zimmermann, 1999: 96) Again, this situation is fundamentally different in Āyurveda. In ancient India, the primary material of knowledge was constituted by the *recitation of series of words* of a more or less stereotyped nature. Finally, he comments, "There could be no zoology in the minds of the Indian scholars, no osteology or physiology." (Zimmermann, 1999: 96) In Indian medical texts, as seen in so many examples, there are numerous instances of misinterpretation of the anatomical terms through ages. One more example – it is only as late as the sixth or seventh century A. D. that, owing to a misinterpretation of the anatomical terms *sandhi* and *aṃsa*, the windpipe or *grivāh* (in the plural) appeared to mean clavicle. (Dasgupta, 1991: 286) It strongly points to absence of any standardization as well as non-uniformity of nomenclature and, in consequence, lack of uniform understanding across different time and space. These terms had contextual meanings only. On the contrary, Latin or Greek terms used in Western anatomical descriptions could avoid such basic problems for scientific terms in international usage. Moreover, conscious efforts have been made to ensure uniform usage, particularly, since 1895. Besides, following works of Morgagni and Bichat, the doctrine of diseased organs "replaced the classical concepts of illness enshrined in the corpus of Hippocrates." (Warren, 1999: 1161) Changing concepts regarding natural world and generation of technical terms went hand in hand in European context. "A philosophy based on particles, action by contact, and denial of purpose could not have the traditional interest in gross anatomy." (French, 1993: 91)

Surgical Instruments and Appliances

Despite all these facts, the surgical and allied branches in the Ayurvedic system of medicine became highly specialized. About 125 instruments and appliances of various sorts were accurately described. These included knives, scissors, syringes, hooks, forceps, trocars, needles, etc. From a detailed description of the appliances, modem medical research workers have been able to recognize the instruments as such. Medical students were instructed in the use of these. Some specimens of surgical instruments used by the surgeons of ancient India may be reproduced.

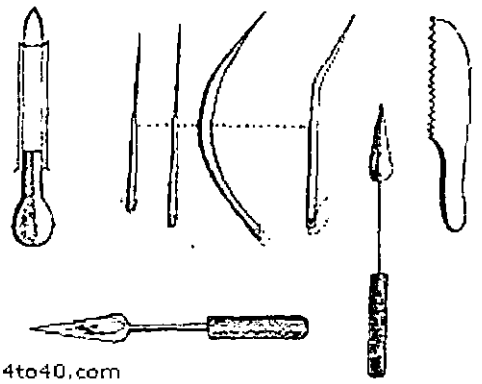


Fig. 8

Courtesy: Google Images

Operations for anal fistula, tonsillectomy, amputations and excisions, couching of cataract, obstetric procedures, venesection, ligation of blood vessels were all described and taught to students. Trephining of the skull and eye operations were also described. (Rao, 1968) Of particular exception was the practice of plastic surgery. It was fairly developed in ancient India and Europe had most likely followed this line of technique during the initial phase of development of modern plastic surgery. The plastic operations of otoplasty (plastic surgery of the ear) and rhinoplasty (plastic surgery of the nose) are described (as discussed earlier) in the 16th chapter of the first book (Sūtrasthānam) of the compendium. First, methods are described for piercing the ear-lobes of an infant which still is a widespread practice in India. Often these ear-lobes, due to the use of heavy ornaments, get considerably expanded and ultimately sunder. Suśruta has described 15 methods of joining these cut-up ear-lobes. For these plastic operations, called Karnabandha, a piece of skin was taken from the cheek, turned back, and suitably stitched on the lobules. Further treatment of the operation, periodic dressing of the wound and the use of various ointments are elaborately described. There are descriptions of so

many other surgical methods. Some of them are – *agnikarma* (cauterization by application of heat), *kṣārakarma* (alkali-cauterization), *śonitāvasecana* (blood-letting), *śalyaśāstra* (removal of foreign bodies and obstructions) etc. *Śalyas* (darts or embedded materials) "may be intrinsic or extrinsic in origin." Intrinsic *śalyas* are due to "local accumulation of deranged *vāyu*, *pitta*, or *kapha*." (Ray, Gupta and Roy, 1993) Two points may be noted here – first, despite description of anatomical organs the surgical theory is finally guided by the doctrine of *doṣa*, and, second, most of the surgical procedures described could be performed without any sound knowledge of anatomy i.e. knowledge of regional anatomy could solve the problems like blood-letting, venesection (Thatte, 1981), or bone-setting. Similar examples can be found in medieval and 18th – century Europe when surgeons were within the category of barber-surgeon. Perhaps the most striking example of this can be had from a case of rhinoplasty (previously discussed in detail), which is supposed to be very sophisticated plastic or cosmetic surgery. In India this was a family craft. Persons totally untrained in anatomy would do this practice. Experiential knowledge accumulated over generations could give amazingly good results of this operative procedure.

Interesting historical evidence, in continuation of the discussion in Introduction, can be cited here. Dr. J. Ward, a witness to an act of rhinoplasty in 1815 in Bombay (which was being practiced as a family craft along the lineage of ancient technique), wrote to his superior:

> DEAR SIR,
>
> In consequence of the conversation I had with you last night about Cowasjee, who had a nose put on at Poonah, in the presence of Mr. Uhthoff and myself, when we belonged to the suite of the late Sir Charles Warre Malet, then ambassador at the above court, I beg to inform you, that the same people who put on the nose said, they were also in the habit of putting on lips; and wanted to perform that operation on the eldest son of our native ambassador at the Paishwah's court, who had lost part of his upper lip: but to this he would not although they told him they agree, had frequently done it with success.
>
> I am,

Dear Sir,

Your obedient humble Servant,

J. WARD.

November 12th, 1815. MR. CARPUE. [Gaspar Taliacozzo, Bologna, 1546–99: pioneer of nose repairs.][7]

Time and space as perceived in Āyurveda

Some of the basic metamorphosing features of modern medicine marked by new knowledge of anatomy, technologies and beneficial practical surgeries may now be touched upon. In *CS*, kāla or time, in relation to disease-production, is described as of two types: *nityaga* and *āvasthika*. *Nityaga* is thought to be related with season and *āvasthika* is related with disease. Again, it is stated – *kāla punaḥ saṃvatsarascāturāvasthā ca*. [*Kāla* or time connotes two meanings, viz. the year and the state of the disease in the patient.] Further, *kālohi nityagascāvasthikasca: tatravasthiko vikaramapekṣate, nityagastu khalu ṛtusātmyapekṣaḥ //* [*Kāla* or time is of two kinds – *nityaga* (which flows perpetually) and *āvasthika* (time as a phase). *Āvasthika* is related to disease, while *nityaga* is related to seasons, days and nights in which wholesomeness of a person is determined. (Sharma and Dash, Vol. II: 73)]

Mazars comments, "Here it is subjective time as perceived by the patient and on which the physician is capable of acting by prescribing a treatment and a diet which are both appropriate to the season and to the state of the development of the disease..." (Mazars, 2006: 28-29) He continues, "This conception of time is at the root of a certain number of notions which in Āyurveda, are related to biological rhythms." It should be noticed that time in this description is not something abstract mathematical unit. It is intimately related with natural rhythm on the one hand and the 'microcosmic' representation of the human body. Time in such context is always embedded, not extracted out of embodiment. It has got nothing to do with scientific, mathematical time.

Regarding space, Carakasaṃhitā informs –

---

[7] Wujastyk, *Surgery in Ancient India*. Reference: http://www.ucl.ac.uk/~ucgadkw/uclma/surgery-slides-pdf.pdf.

deśa punaḥ sthānaṃ, darvyāguṇānāmutpattiprcaraṇ deśasātmyaṃ cācaste: (Vi. 1.22.5) [*Deśa* means space. The knowledge about origin, circulation or movement and *deśasātmya* (acclimatization to a region) of *dravya* (substance) can be obtained from *deśa*.] It must be noted that space in this explanation is never used as a category to understand the body, rather the inside of the body. On the other hand it signifies the space or habitat wherein a whole person or a human being is situated. This question will be dealt with at a greater length later on. In *SS*, time (Kāla) is represented thus: "The Sun-god, by his peculiar motions, divides eternal time which is measured by years (Samvatsaras) into increasingly progressive but smaller subdivisions such as, Nimeshas (lit: - time taken for closing eyelids), Kāsthās, Kalās, Muhurtas, days and nights, fortnights, months, seasons, solstices, years and Yugas. Time taken in articulating any of the short vowels (such as A, etc.) is called an Akshi-Nimesha. Fifteen Akshi-Nimeshas make one Kāsthā. Thirty Kāshthās make one Muhurta. Thirty Muhurtas make one day and night. Fifteen days and nights make one fortnight. A fortnight is either dark or bright. Two fortnights make one month." (Bishagratna, Vol. I: 45-46) These are the smallest units of time we find related to medical practice.

In *jyotiṣa śastra* time measurement proceeded along the almost similar line. [124 *kās thās* = 1 *kalā*, 20 and 1/10 *kalās* = 1 *muhūrta*, 30 *muhūrtas* = 1 *ahorātra* (day and night), 2 *parvans* = 1 *cāndramāsa*, 2 months = 1 *ṛtu*, 2 *ayanas* = 1 year.] "Time is self-existent (*svayambhū*), without beginning, without end, and without middle. Even the minutest fraction of time is ever-existent...The functions of time succeed each other perpetually like the different parts of a revolving wheel. This wheel of time (*kālacakra*) revolves eternally with continuous change. Time is reckoned and measured by the motion of the sun in the heavens." (Ray, Gupta and Roy, 1993: 19)

One characteristic of Sanskrit language – the receptacle of medical texts in India – may be mentioned here. In the classical Indian languages, there are no words which corresponded to the concept "to become." The verb formed from the root **bhū** can be translated as both "to become" and "to exist." These two aspects of perceived reality, conceived as antithetical by the Western mind, are not even distinguished. "To become" is merely an aspect of "to exist." The noun **bhava**, formed from the same root, can mean either "being born" or "existing", in other words, to become is to be born. To express the

idea of change at all, Indians had to make shift with the words **anyatha bhavati** or **anyathabhava** "being otherwise." Becoming is expressed in terms of being, dynamic is seen as a phase of static. The point of view permeates the language. The noun, which expresses the more stable and unchanging aspects of a thing, is in Sanskrit more likely to be used than the verb, and correspondingly adjectives are more frequent than adverbs. In classical Sanskrit, indeed, especially in prose writings, it became usual to employ verbal nouns or participles instead of finite verbs. For example, the sentence "Because of the rain, the food appears" is expressed in classical Sanskrit as "Because of the rain, appearance of the food (is possible)." It has been the practice since ancient times to use the participial form instead of the finite verb to express the past tense, and it became a common expression in colloquialism of the later periods. Sanskrit will also use an adjective, which is static in feeling, to express an idea which might take a verb in the languages of the West. "The classic Western expression of the sense of flux uses a vivid and specific verb. "All things flow" (pa/nta rei), The corresponding idea is expressed in Sanskrit as **sarvam anityam**, "all existences are impermanent." (Ess, 2000)

In India, medicine, like everything else, was inextricably linked to larger rhythms and to the community. (Lee, 2000) Contrarily, in scholarship in the Western tradition the sensitivity for temporal ordering dominates more and more. (Houben, 2002: 473) It may be illustrated by the fact that in the classical Indian languages, there are no words that corresponded to the concept "to become." The verb formed from the root *bhū* can be translated as both "to become" and "to exist." These two aspects of perceived reality, conceived as antithetical by the Western mind, are not even distinguished. The classic Western expression of the sense of flux uses a vivid and specific verb "All things flow". The corresponding idea is expressed in Sanskrit as *sarvam anityam*, "all existences are impermanent." To connect two ideas, Western languages use such conjunctions as and or then; Sanskrit, in contrast, will express the same idea by adding the demonstrative pronoun *sa* to the subject of the sentence, as if "John runs and jumps" were to be expressed as "John running he jumping." The conjunction emphasizes the separateness of events; the demonstrative focuses on the subject, unchanging through time. This particular inherent structure of Sanskrit texts might thwart the question of scientific structuring of time measurable in small quanta for well-structured patients' history. Time

perceived to the level of a fundamental principle probably reflects the development of an agricultural economy. (Nakamura, 1992: 64) In precolonial India, measurable time had a minimal role to play in the everyday life of the majority, nor was there anything like state-regulated time.

Coming to the colonial period, time measured with precision, and uniform over a defined space, was considered necessary for modern systems of regulation. "The subjective experience of life-cycle time could now be projected into a new *epistemic* domain rendering it objective, measurable and linear." (Kalpagam, 1999)

While applied to the modern medical body this particular notion of time is signified in a quite different way "The essence of Sir Francis Bacon's 17th-century conquest and dissection of nature was the transformation of time from static, ever-repeating cycles to linear progression. Modern science was made possible by the clock. Modern, scientific time is a one-way street, going from point X to point Y and never coming back." (Lee, 2000) The sense and sensation of time are central to the differences between traditional and scientific medicine. Older units of time were transformed into universal, scientific quanta of time like second, minute and day. "The next significant technology of medicine to use time as its orienting focus is the clinical chart... Clinical charts thus provided clinicians with a comparative and comprehensive perspective on how their interventions influenced the illness, and so became visual health outcomes records." (Reiser, 2000: 33) We should recall that (a) examination of pulse was reframed within a rubric of "universalized" time, rate/minute, though, not in its descriptive character as practiced by the āyurvedic healer (Lad, 2007), and (b) the use of stethoscope was instrumental to diagnose anatomo-physiological dys-functions inside the depth of the body (i.e. organ localization of disease) and ushered in miraculous *therapeutic* results instead of *prognosis* in āyurvedic practice. And, to add, all these were results of accurate anatomical knowledge of modern medicine. Now the question of space relevant to the discussion of the body and therapies may be discussed.

The Nyāya-Vaiśeṣika philosophical school has greatly influenced the doctrines of Āyurvedic understanding of nature of body and substances. Following this philosophical system, "the *Caraka-saṃhitā*... enumerates the five elements, *manas*, time, space and the self as substances (*dravya*)." (Dasgupta, 1991: 369) *Caraka-saṃhitā* further states, "A

patient is the very space or *kāryadeśa* for administering therapies." (Vi, 8.94) Again, "*Deśa* (Habitat): - Both the land as well as the patient constitutes *deśa* or habitat." (Sharma and Dash, Vol. II: 254) The patient is to be examined "with reference to *pramāṇa* or the measurement of his bodily organs. This is determined by measuring the height, length and breadth of the organs by taking the finger breadth of the individual as the unit of measurement." (Ibid, 272) Some of these measurements are such – feet 14 fingers, knees 4 fingers in height and 16 fingers in circumference, thighs 18 fingers in height and 30 fingers in circumference, heart (*hṛdaya*) 3 fingers etc. The entire body is 84 fingers in height and 84 fingers in breadth. Sharma and Dash comment, "There is difference in the statement of the Suśruta and the Caraka regarding the height of the body. According to the former, it is 120 *añgulas* whereas according to the latter it is only 84 *añgulas*. This is due to the difference in the measurement of the basic unit i.e. *añguli* which is smaller according to the Suśruta from what is described here (i.e. in the above mentioned measurements)." (Ibid, 275)

All the measurements, as already discussed, are normalized and in harmony with natural metaphors. In *Śārṅgadhara-saṃhitā* –

jālāntaragate bhanau yat sūkṣaṃdṛśyate rajah /

tasya triṃśattamo bhāgaḥ paramāṇuḥ sa ucyate // (Pū, 1.15) [When the rays of sun enter through the window and the minute particles are observed thereby, the thirtieth part of that very particle may be called as an atom.] These smallest parts of the objects found in nature are taken for measurements. There different schools of measurements too in *Śārṅgadhara-saṃhitā*. Whatever comes as an explanation of differences in the bodily measurements according to two of the *Bṛhattrayīs*, the fact remains that the actual measurement of the body even in its gross appearance is not to be found. The same holds good for the internal organs. One should understand that this perhaps points to the fact that actual dissection was not in practice in medical education. That is why so many discrepancies arise while the texts illustrate the details of the 'material' body, but not of the 'bodily frame'. Basham comments, "the earliest medical text, that of Caraka, does not mention surgical operations at all. Evidently, from the point of view of the compiler, surgery was an aspect of medicine beneath the notice of the *vaidya*, to be performed by low-caste persons such as barbers... The taboo on contact with

human corpse was so strong, however, that even the emancipated *vaidya* dared not infringe it." (Basham, 1998: 27)

Some other aspects of Indian anatomical perception should be mentioned here. Regarding the origin and manifestations of *gulma* (phantom tumour) anatomical and physiological anomalies become once again explicit. *Gulma* is supposed to originate from vitiated state of *vāyu*, *pitta* and *kapha*. "Urinary bladder, umbilicus, heart and two sides of abdomen (*pārśva*) these are the five sites of manifestation of *gulma*." (Sharma and Dash, Vol. II: 255) Even if all the organs described above are true in their anatomical location, it becomes very difficult to explain how heart can be a site of phantom tumour. Another problem may from knowledge of origin of great vessels from heart. "There are ten vessels of great biological importance attached to the heart. The synonyms of heart *inter alia* are '*mahat*', '*artha*' and '*hṛdaya*'." (Sharma and Dash, Vol. I: 592) It is perhaps easily understandable that though the heart is assumed here to be associated with the origin of vessels of great importance, truly speaking, it is not represented in any anatomical sense (in modern terms). Rather it connotes psychic components of a person. Any organ described for the purpose of biological reality may be associated with non-biological meaning. In Kautilya's *Arthaśāstra*, references are found for dissection to study the examination of contents of stomach for traces of poison. (Mukhopadhyaya, 1974: 363) An anecdotal reference of cutting open the stomach of a person is found in a story of the Emperor Aśoka's young wife Tisyarakṣitā "It happened that Aśoka became very ill. Tisyarakṣitā commanded the doctors to send her a man suffering from the same disease; she had him killed, slit open his belly, and examined the stomach." (O'Flaherty, 1986: 35) Another anecdotal, yet interesting, example may be cited here. *Rāmāyaṇa* is the epical text which has shaped Indian populations subjectivity and societal orientation for generations. It is in some sense 'text-as-authority' per se. In the fifth *kāṇda* (Sundara Kāṇda) Sitā laments, "If Rāma the Ruler of the world does not come here, the evil Rāvaṇa, the king of Demons will cut off my limbs with his sharpened weapons, even as a surgeon would cut the limbs of a lifeless foetus." (*Rāmāyaṇa*, V. 28. 6) This particular passage points to some facts – first, Rāvaṇa has been compared with a surgeon, and, second, surgeons cut the limbs of a lifeless foetus. Does it indicate that any kind of surgical (anatomical) practices was in vogue in the society of *Rāmāyaṇa*? We do not have

any answer. But it keeps us pondering over the issue. To add, "Indian medical texts do not contain case histories of individual patients, or records of remarkable cures..." (Basham, 1998: 26) Contrarily, in the Western world individual case history taking and keeping a statistical account (in modern sense) of the jobs done were possibly a common practice. A comparative study with Galen's mode of practice may help us understand the issue in a better way. Galen even treated patients by correspondence, and sent therapeutic instructions and medicaments along with the diagnosis. Galen writes, "You should know that I have not only (personally) treated persons from this ailment but through correspondence I have cured some patients residing in other countries. Some sent me letters from Iberia (Spain and Portugal), from Celtic lands, from Asia, Thracia (the Balkans) and other countries, asking me whether I knew and could dispatch a trustworthy medicine against the beginning of suffusion." (Horstmanshoff, 1995: 86) As already discussed, absence or non-existence of anatomical atlases in Āyurvedic texts is an important characteristic feature. In fact, the visual representation of the medical body is a remarkably late phenomenon in Indian culture. However, some of the very earliest texts surviving from ancient India do deal with the body in detail as the subject of elaborate sacrificial rites. (Wujastyk, 2009) Knowing the body through dissection (and opening up inside out) was a spectacle for combing "real medicine" with "validity of ocular demonstration." (French, 1993: 86) Knowing is an art; science requires personal participation in knowledge. An anatomist's task in European tradition was to distinguish between *verbal* description and *visual* representation. Hopefully, two examples about 300 years apart would help to clarify the question concerned here.

Fig. 9

[The Clibanus-Zodiac Man. An accurate and detailed interpretation of the anatomy of man, the microcosm as described by Mondino (1258-1326) correlated with one aspect of his relation to the macrocosm. This illustration is 300 years before the Vesalius' historical text. Even in that period the organs seem to be organized not in one plane. They reveal the depth of the body. **Courtesy:** C. E. Kellett, "Two Anatomies," Medical History 8 (1964): 342–353.]

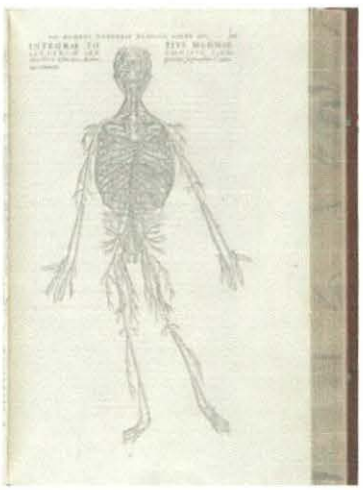


Fig. 10

[One of the spectacular anatomical illustrations from Vesalius - *De corporis humani fabrica libri septem.* (Basel: Johannes Oporinus, 1543), 395. Though guided by humoral theory this picture illustrates the three-dimensional vascular and bony structure of the body. **Courtesy:** *Historical Anatomies on the Web* (National Library of Medicine, US.]

Two other images, strictly in accordance with the classical Indian medical system, Āyurveda, are shown below. (Wujastyk, 2007) This will help to differentiate between two- and three-dimensional representation of the body. In this picture all the bodily organs lie in the same plane. The viewer cannot fathom the depth of the body.

Fig. 11

[**Indian anatomical painting:** (the picture above) c. 18th century, Western India. In the *Taṣ rīḥ-i Manṣūrī* style, but in an old-Gujarati manuscript. Wellcome MS Indic _74. **Courtesy:** Wellcome Library, UK.[8]]

III Medical Education in Ancient India

Modes of acquisition of knowledge in Āyurveda

In *Caraka Saṃhitā* it is stated in a clear manner that one cannot perceive a thing in its entirety by the knowledge only of a part of it and the physicians unsound in correct knowledge of disease is also confounded in the logic of therapeutics. "Such mistakes are committed by those who want to perceive a thing in its entirety by having only a partial knowledge of it." (Sharma and Dash, Vol. II: 198) Opposite to the good physicians, there were "the pseudo-physicians who instead of taking away the diseases, take the life itself." (Ibid, 589) How could these pseudo-physicians harmful to the society practice freely?

[8] For a comparative study of Āyurvedic body with European anatomical body see, Bhattacharya, 2009.

"These traitors in the garb of physicians move around the world due to the lack of vigilance on the part of the rulers." (Ibid, 589)

Three pertinent questions emerge out of this account – (a) the pseudo-physicians are very much deficient in the knowledge of medicine which must be taught in a regular and prescribed mode accepted by the norms of the society at that time, (b) the lack of vigilance on the part of the rulers did lead to such a situation, and (c) the rulers must be the license giving authority of an aspiring physician. Attendant to this problematic one must be inquisitive to know how this knowledge of medicine was being produced, how was the structure of that knowledge production and what was the nature of this knowledge of medicine. It is helpful to remember Basham's observation in this context, "The instruction of textbooks can only be taken as normative, and not as having been universally applied." (Basham, 1998: 25) The situation was so because of the possible fact that as described above there were so many untrained charlatans and quacks practicing medicine. "Nevertheless, the norms established by the texts are so strict that one cannot believe that they had no effect on the standards of medical practice." (Ibid, 25) Basham notes that the Vedic word *bhiṣaj* became increasingly known as *vaidya*. (Emmerick, 1993) "Since the word *Veda* is also related, the term has religious overtones which *bhisaj* lacks...The English "doctor" is semantically analogous, though here the emphasis is rather on the physicians giving instructions than on his acquiring it." (Basham, 1998: 23)

What were the attributes of a physician? "Excellence in medical knowledge, an extensive practical experience, dexterity and purity – these are the four qualities of physician," (*CS*, Sū, 9.6) Also, "Good memory, obedience, fearlessness and uninhibited expression – these are the four qualities of a patient." (Sū, 9.9) This particular issue is of considerable importance because of the fact that the patient is not meant to be an inert objectified body of medical knowledge for the physician. S/he must have 'fearlessness' and 'uninhibited expression.' These attributes tilt the patient-physician relationship towards patient-oriented medical practice, although it should be kept in mind that the specificity of religio-ethico-normative structure of ancient had taught people to regard physicians with great reverence and humility

The *SS* teaches us, "A physician, ignorant of the science and art of surgery and emollient measures Sneha-karma, etc. is but a killer of men out of cupidity, and who is allowed to carry on his nefarious trade only through the inadvertence of the king. A physician well versed in the principles of surgery, and experienced in the practice of medicine, is alone capable of curing distempers, just as only a two-wheeled cart can be of service in a field of battle." (Bhishagratna, Vol. I: 30) One must take note of the use of analogy with 'two-wheeled cart' and 'field of battle.' This may point to the fact that physicians' service was needed in the battlefield. Hence the question of king as the issuing authority of license for medical practice appeared in the texts. "The completion of the course was followed by an examination. This is implied by the observation of Charaka and Suśruta that it is the king's fault, if incompetent doctors practise the medical profession. Śukra also prohibits a person to practise as a doctor without possessing the king's license." (Altekar, 1944: 187)

For the proper study and practice of these different specialized branches of medicine, a good training in certain basic subjects formed the essential ingredients. These were: (a) anatomy, including dissection, and physiology (*śarira-vṛtti*); (b) aetiology (*hetu*); (c) pathology and pathogenesis (*vyādhi*); (d) therapeutics (*karma*); (e) objectives (*kārya*); (f) climatology (*kāla*); (g) pharmacology (*karana*); (h) medical and surgical procedure (*vidhi*). A methodology for science in general existed at that time and these principles were rigidly applied to medical science, in common with the philosophy of natural sciences. These were: (a) direct observation (*pratyakṣa*); (b) testing of the validity of observed facts (*anumāna*); (c) analysis of the facts observed (*yukti*); and (d) testimony of experts (*āptopadeśa*). Meulenbeld explains these categories thus – direct apprehension (*pratyakṣa*), inference (*anumāna*), comparison (*aupamya*) and trustworthy tradition (*etihya*). (Meulenbeld, 2008a) A wise man, desirous of adopting medical profession should, first, carefully select a suitable text on medicine. "There are several such texts available for physicians." (*CS*, Vi, 8.3)

Existence of a number of medical texts, probably competing, is revealed in this passage. Presumably, among these texts, *Carakasaṃhitā* is forwarded as the most dependable text. So the question of 'normative' text as pointed out by Basham becomes evident. Edelstein's study of The Hippocratic Oath might of help here to realize the

position in a more comprehensive way, "An ancient doctor who accepted the rules laid down by "Hippocrates" was by no means in agreement with the opinion of his fellow physicians; on the contrary, he adhered to a dogma which was much stricter than that embraced by many, if not by most of his colleagues." (Edelstein, 1987: 14-15) A prospective student of medicine had to take some of these Oath of Initiations (Menon and Haberman, 1970) – (1) Thou shalt lead the life of a celibate, grow thy hair and beard, speak only the truth, eat no meat, eat only pure articles of food, be free from envy and carry no arms. (2) If thou desirest success, wealth and fame as a physician and heaven after death, thou shalt pray for the welfare of all creatures beginning with the cows and Brahmanas. (3) No persons, who are hated by the king or who are haters of the king or who are hated by the public or who are haters of the public, shall receive treatment. Similarly, those who are extremely abnormal, wicked, and of miserable character and conduct, those who have not vindicated their honour, those who are on the point of death, and similarly women who are unattended by their husbands or guardians shall not receive treatment. (4) There is no limit at all to the Science of Life, Medicine. So thou shouldst apply thyself to it with diligence. This is how thou shouldst act. Also thou shouldst learn the skill of practice from another without carping. The entire world is the teacher to the intelligent and the foe to the unintelligent. Hence, knowing this well, thou shouldst listen and act according to the words of instruction of even an unfriendly person, when his words are worthy and of a kind as to bring to you fame, long life, strength and prosperity.

Menon and Haberman comment, "The spirit of the oath is essentially religious and it is apparently administered in a ritualistic manner." (Menon and Haberman, 1970: 296) Further, ""Not carrying arms' also has special significance in that this instruction implies that students of medicine did not necessarily have to come from the Brahman class; in practice, as Brahmans did not carry arms at any time, this statement would be redundant." (Ibid, 297) The authors make a relevant remark in their review, "This oath appears to be an indigenous product of Indian thought and culture. As pointed out in the commentary, most of the ideas found in the oath can be traced to similar concepts and sayings in the non-medical Indian literature of antiquity. The style of the oath, the rituals involved, the asceticism required of the student, the student-teacher relationship, the emphasis on the limitlessness of knowledge, the association of worldly prosperity, fame

and ethical practices: all these are in conformity with the mainstream of Ancient Indian thought and practices." (Ibid, 298) It is important to mention here that the medical profession was not like the Vedic scholarship an exclusive monopoly, in theory or practice, of any particular caste. Hence, Suśruta holds that a Kṣatriya or a Vaiśya physician also can play the role of the teacher for boys of his own caste. Altekar comments, "It is quite probable that Kshatriya and Shudra surgeons may have been, by tradition and environment, better adepts in the use of the knife than their Brahmana and Vaishya compeers." (Altekar, 1944: 290) Now the way a medical student conducted his mode of study and attaining his knowledge through participation in debates should be addressed. Debiprasad notes, "The *Carakasaṃhitā* also mentions theoretical conclusions characteristic of the other systems of medicine, i.e. differing from the one supposed to be codified in the text." (Chattopadhyay, 1977: 366) Therefore, he derives, "Apparently, in the ancient period, medical science is yet to be tongue-tied by authority, clash of views having much to contribute to its growth." (Ibid, 366) He further comments, "To resist the invasion of medical science by Vedic orthodoxy, the physicians require the general rule of excluding the possible confusion of contexts." (Ibid, 369) This last conclusion, among many other conclusions by him, seems to be over-emphasized. Another observation of much importance should be mentioned here, "Given the authoritativeness of the four 'classical' medical works, it is no wonder that these in course of time came to be supposed to contain all the necessary theoretical discussion on anatomy and physiology" as a result of which "it is thus not surprising that later works have occupied themselves more and more primarily with diseases, their symptoms and cures." (Das, 2003: 312)

Procedure of study

Ancient Indians regarded knowledge as unlimited and no period that one could spend for its acquisition was regarded as adequate for the purpose. The duration and contents of the course were therefore largely determined by the will, capacity and convenience of the student. Some students who wanted to get an all-round mastery used to read for as many as 25 or 30 years. Others who were home sick or were content with a superficial knowledge, used to return home in six or even three years. Altekar informs, "literacy was spread fairly widely among the higher classes." (Altekar, 1944: 102)

"He should get up early in the morning or in the last quarter of the night. He should then perform ablution and offer prayers to the gods, sages, cows, *brāhmans*, teachers, elderly and enlightened persons and preceptors and should then sit on an even and clean place. Thereafter, he should recite the *sūtras* orally with due concentration." (Sharma and Dash, Vol. II: 218) After proper understanding, to rectify his deficiencies and that of others he would go on repeating his recitation. "He should continue with his practice in the noon, in the after-noon and at night without any break." To increase one's knowledge "A physician should participate in a discussion with another physician. Professional discussion indeed promotes the power of application of knowledge and competition leading to enlightenment... During the course of discussion one comes to know of many new things which were not heard by him previously." (Ibid, 225-226) An assembly was of two types – (a) enlightened, and (b) dull. "In an assembly where members are neutral and are attentive, inclined to hear, learned, experienced, having the power of retention, speech and contradiction; one should carefully observe the good and bad qualities of the opponent as a participant in the discussion." (Ibid, 229) Regarding the nature of a *vāda* (debate) it usually is of two types - *jalpa* (disputation) and *vitaṇḍa* (wrangling). Then definite methods and steps to enter and engage into debates are discussed. To note, *vāda* is called by Caraka *sandhyāya sambhāṣā* too. (Matilal, 1997: 12) "Caraka makes a significant comment in explaining the concept of "reason" as part of the demonstration. The "reason" is what causes the apprehension or recognition of the object or the fact to be proven." (Ibid, 14) At the root of all these debates there lies the question of epistemology – comprising the characteristics of what we call 'Indian logic.' Matilal emphasizes "the claim to be that this was a different conception of logic, where the study of the connections between mental events and the justification of inferentially-acquired knowledge-episodes is not a fault." (Ibid, 14) This may be conveniently called "psychologized epistemology." (Mohanty, 2001)

It will be evident through the rest of the dissertation that this particular characteristic of Indian knowledge system was completely reconstituted by the introduction and transmission of Western knowledge in general and anatomy-based medical knowledge in particular. If it was good or bad is not the question of thesis. It only tries to trace the locus of these changes.

Suśruta Saṃhitā illuminates on the mode medical education through other details, "it is extremely difficult to classify drugs, taste, virtue (Guna), potency (Virya), transformatory or reactionary effect (Vipāka), fundamental bodily principles (Dhātu) bodily excrement (Mala), hollow viscera (Āshaya), vital parts (Marma) veins (Sira), nerves (Snāyu), joints (Sandhi), bones (Asthi) and the fecundating principles of semen and ovum, and to extricate any foreign matter lodged in an ulcer), or to ascertain the nature and position of ulcers or fractures, or the palliative, curable or incurable nature of a disease, etc." (Bishagratna, Vol. I: 33) Bishagratna comments, "these subjects perplex even the profoundest intellects though a thousand times discussed and pondered over, not to speak of men of comparatively smaller intellectual capacity." (Ibid, 34) Therefore, it becomes "imperatively obligatory on a pupil or a disciple to attentively hear the exposition of each shloka, or a half or a quarter part thereof, made by the preceptor (while studying the science of medicine)." (Ibid, 34) One must be careful of some of the terms used in the passages above. The entire learning process was based on *oral recitals* – no example of writing is mentioned anywhere. That is why, particularly in *SS*, at the end of most of the chapters there are 'mnemonic verses.' Education, as a result, "depended solely on learning by heart the texts and on instructions regarding the actions to be performed at different steps...whether they took up philosophy, grammar, classics, medicine or theology, had to think and understand, though even with them wholesale recitation was insisted on." (Bokil, 1925: 246-247) To mention, the number of students per teacher would vary from four to 20. So, it seems obvious enough, in such an education system 'Western' natural philosophical practices will remain absent.

There is mention of different kinds of operations such as Incising (Chhedya), Excising (Bhedya), Scraping (Lekhya) Puncturing (Vedhya), Searching or probing (Eshya), Extracting (Abārya), Secreting fluids (Visrāvya) and Suturing (Seevya). "A surgeon (Vaidya) called upon to perform any (of the eight preceding kinds) of operations, must first equip himself with such accessories as surgical appliances and instruments, alkali, fire, probe or director (Shalāka), horns, leeches, gourd (Alāvu), Jamvavoushtha (a kind of pencil shaped rod made of slate with its top-end cut into the shape of a Jamboline fruit), cotton, lint, thread, leaves, tow (Patta), honey, clarified butter, lard, milk, oil, Tarpanam (powdered wheat soaked in water), decoctions (Kashāya) , medicated plasters,

paste (Kalka), fan, cold water, hot water, and cauldrons, etc., and moreover he shall secure the services of devoted and strong-nerved attendants." (Bhishagratna, Vol. I: 37)

Private teachers usually imparted medical education. (Altekar, 1944: 185) According to Altekar, "Anatomical knowledge that was thus imparted was fairly high when compared with the contemporary standards elsewhere. Unfortunately in the course of time the dissection of human body went out of vogue, causing a setback to the progress of the medical science." (Ibid, 186) He also emphasizes that owing to the prevalence of stricter notions of ceremonial purity, the touch of the corpse became a taboo and dissection was consequently given up. This became fatal to progress in surgery, the practice of which gradually died down. The medical profession began to be held in low esteem as the doctor had to deal with filthy diseases and touch dying patients. (Ibid, 189) Altekar also observes, "Unfortunately for the progress of learning and scholarship Vedic literature was canonised some time about 600 B.C.... Theories began to be accepted or rejected according as they were in conformity with or opposed to the statements of the sacred books on the point." (Ibid, 251)

Now, the question of "Duration of the Course and Examination" may be discussed. The exact duration of the medical course is not known. Caraka and Suśruta do not enlighten us on the point. Caraka observes that no one can obtain a real all round efficiency in Āyurveda; this would also suggest a very long course. Altekar comments, "We may well presume that the student had to spend at least eight years, before he could get mastery in the subject." (Altekar, 1944: 187) He also notes, "None of our authorities however discloses the conditions under which the royal permission was granted under efficient administration. Very probably it must have been given to students who were certified to have finished their course either by superintendents of state hospitals, principals of colleges or famous private practitioners." (Ibid, 187) He finds that Mitākṣarā would show that the medical course was finished in four instead of eight years during the 12th century A. D. Here, one may argue that Altekar's previous analysis of solely private nature of education possibly does not comply with his observation of certificates being given by 'superintendents of state hospitals.' Training in the medical profession was efficient in India down to the 10th century A. D. Āyurvedic doctors were keeping themselves in touch with the discoveries and developments taking place

elsewhere, and experimenting upon new preparations as better medicines for ailments and diseases. The use of mercury, opium and metallic preparations was introduced into the pharmacopoeia in the medieval times. To stress, discontinuance of dissection and consequent decline in surgery however gave a setback to the system. "Owing to the prevalence of stricter notions of ceremonial purity, the touch of the corpse became a taboo and dissection was consequently given up. This became fatal to progress in surgery, the practice of which gradually died down. The medical profession began to be held in low esteem as the doctor had to deal with filthy diseases and touch dying patients." (Ibid, 189) Another point of mention is that Hindu education was thorough, but it was not sufficiently broad. Each branch was thinking of its own problems. Educationalists do not seem to have bestowed much thought on the relative utility of the study of the different branches like grammar, literature, logic, philosophy, mathematics and fine arts for the development of the intellect, the mind and the imagination. Specialization was started too early. As a result, "Hindu education had ceased to remove prejudices, explode superstitions and broaden the mind, so as to keep it capable of receiving instructions from all quarters by the beginning of the 9th century A. D." (Ibid, 289)

One more point may be raised here. As may be expected, there is no unanimity of views among ancient Indian thinkers also about the relative importance of nature and nurture. A young people, fortunate to have a series of successes, naturally feel that there is nothing impossible or difficult for man. Vedic Aryans belonged to this category and their age therefore did not much believe in heredity or natural endowments. This is emphatically expressed in one of the hymns of the Atharva Veda, where we are told that given proper education, everything can be accomplished. Even Indra owes his supremacy among the gods not to any penance or previous merit, but to his proper training during his student-hood. "A few centuries later we find a patriarch praying that some of his sons should become good priests, others brave warriors and the rest successful merchants (S.Br., X4.1.10) Obviously he did not much believe in heredity and held that a good deal depended upon proper training and education." (Altekar, 1944: 37) The duty to provide free education that was imposed upon teachers and institutions must also have naturally

resulted in making the admission test a stiff one. The test was partly moral and partly intellectual. Morally disqualified students were summarily rejected (Nirukta, II. 4).

Education was so long a private concern. The rulers looked into or visited educational institutions only for the sake of encouragement. Charity, either private or state, was the only source of income for them. No uniform standard of attainments was codified or insisted on by any central authority. The master or guru had his own way in teaching and managing except in so far as he respected the suggestions or criticisms of his patrons. (Bokil, 1925: 8) There was no question of fees to the teachers or preceptors for providing education or learning to students. It is necessary to note that what has been condemned by the sacred texts is a stipulation for the payment of fees as a condition precedent to admission; they have no objection to teachers accepting voluntary gifts from the guardians of students reading under them. Just as the teacher was exhorted to remember that teaching was his sacred duty, the guardian also was asked to note that no object in the universe, howsoever precious it may be, could be regarded as an adequate fee for even that humble teacher, who teaches a single letter of the alphabet. But in case of students being poor "Students whose guardians were really too poor to pay any honorarium were expected to help the teacher in his household work and pay him some honorarium at the end of the course by collecting subscriptions for the purpose." (Altekar, 1944: 80) The paternal relationship of the teacher towards the pupil was emphasized by the absence of any regular fee. The ideal is thus a domestic one (exceptions being there like universities like Taxila and Nalanda), and it is quite foreign to the Indian system that there should be a large institution or a large class of pupils taught together. All available evidence shows that the strength of a class under one teacher was usually about 15. Nalanda used to have about a thousand teachers for its student population of not more than nine thousand. In the 11th century in the Vedic college at Ennāyiram, each teacher had only about 20 students under his charge. At Benares during the 17th century, sometimes only four and usually about 12 to 15 students used to work under one teacher. In the 19th century the number of students under one teacher in Sanskrit schools at Nadia varied from 10 to 20. It therefore seems to be almost certain that the Jātaka statement about the teachers at Taxila having 500 students each is

an exaggeration. The normal strength of a class was never more than 20. (Altekar, 1944: 82-83)

It will be later seen that this particular characteristic of Indian education did have bearing on stagnation of medical education as a whole and anatomical knowledge and rise of hospitals in particular.

Unlike West, in India it is the teacher rather than the institution that is prominent, and the same affection and reverence which a Western student has for his *alma mater* is in India bestowed with a life-long devotion upon the teacher. Keay comments, "Even the introduction of Western education with its many teachers, and many classes, has not entirely broken down this ideal, in spite of the complications which it produces. To an Indian student a teacher who only appears at stated hours to teach or lecture, and is not accessible at all times to answer questions and give advice on all manner of subjects, is an anomaly." (Keay, 1918: 179) He asserts, "There is no country in the world where the responsibilities and opportunities of the teacher are greater than they are in India." (Ibid, 179)

This scenario began to change for ever with the arrival and consolidation of English education system. English education system did yield many beneficial results for India's advancement and rupture with scripture-bounded knowledge system. But we must have our critical look at this historical phenomenon with particular reference to medical education and anatomical knowledge. Keay found, "An ideal of Indian life which has a close bearing on education is that which has been happily termed *naissance oblige*." (Ibid, 180) Counteracting this spirit, "The tendency to extend a uniform system and so to reduce all education to the dead level of a code-bound type is already at work in India." (Ibid, 180) It should be noted that making of a 'uniform system' was gradually becoming ubiquitous. It reached out to almost every aspect of life and reconstituted the various branches of knowledge systems in an asymmetrically overdetermined space.

The transition from ancient and medieval India to colonial or modern India was not a straightforward journey. There was an intermission by pre-colonial or 'on the eve of colonialism' India. But, it should be remembered that the understanding of the relationship of *śāstra* ('theory') to *prayoga* ('practical activity') in Sanskritic culture is shown to be diametrically opposed to that usually found in the West. Theory is held

always and necessarily to precede and govern practice; there is no dialectical interaction between them. (Pollock, 1985)

At a later period in 1853, J. W. Kaye wrote about the significance of the establishment of the Medical College, Calcutta, "I think that the foundation of the Medical College of Calcutta is one of the greatest facts in the recent history of Indian Administration. Half a century ago, a project for the establishment of an institution, intended to convey to the natives of India instruction in European medical and surgical science, would have been scouted as the chimera of a madman." (Kaye, 1853: 617) From "the chimera of a madman", Western medical education became an irreversible reality.

In this concluding part of this chapter, one example can be cited from *Carakasaṃhitā*. Twenty-fifth chapter of Sūtrasthāna opens with a polemical situation where sages like Vāmaka, Pārikṣit, Vāryovida, Śaraloman, Hiraṇākṣa, Kāñkāyana etc. participated. In the final part of the debate disagreeing with "Bhardvāja, Kāṅkāyana said that if *Svabhāva* (nature) is taken to be the root cause of living beings it would mean that individual efforts (e.g. performance of rituals, cultivation, study etc.) are altogether useless." The debate was about to go on. But during the course of this controversial discussion of the sages Lord Punarvasu said –

tatharṣīnāṃ vivadatamuvacedaṃ punarvavasu ḥ māivaṃ vocata tattvaṃ hi duṣprapaṃ pakṣasaṃśraya // (Sū. 25.26) [Please do not enter into such a controversy; it is difficult to arrive at the truth by taking sides with its partial aspects.]

Fatal termination of such a debate points to the fact that in the final analysis it was *āptopedeśa* (testimony of trustworthy persons), which became victorious. It was not the other way – neither *pratyakṣa* (direct apprehension) nor *anumāna* (inference) and *yukti* (proper application) – that was valid in the debate. (Roy, 2004)

In the following sections of this dissertation, there will be gradual explorations into this problematic.

Chapter 2

Precolonial Period of Knowledge: Āyurveda and Anatomy

I Introduction

II India through the Eyes of Travellers

III Specificity of Āyurvedic Knowledge on the Eve of Colonialism

Introduction

In his '*Indian Knowledge-Systems on the Eve of Colonialism*' project, Sheldon Pollock the structure and social context of Sanskrit science and knowledge from 1550 to 1750 has been investigated. The period witnessed a flowering of scholarship lasting until the coming of colonialism, when a decline set in that ended the age-old power of Sanskrit thought to shape Indian intellectual history. One of the aims of the project was to study the status of medical knowledge systems – principally as expressed in the Sanskrit language. Indigenous modes of medical thought and expression on the eve of colonialism set the Indian scholarly establishment of brāhminical learning – including medicine – at a peak of creativity and innovation, but was about to disappear forever. The intellectual life of indigenous India up to this time, however, was conducted principally in Sanskrit and Persian. But, particularly, there is almost total absence of secondary sources about early modern Indian intellectual life in this period. The project was cautious about the specific nature of non-Western society like India. It is understandable that when one comes to non-European history, great care has to be taken not to impose convenient and familiar categories on situations where the entire inner dynamic of historical and social changes is different. In a recent book there is a bold hypothesis related to this period "the sixteenth, seventeenth, and eighteenth centuries in South India saw the emergence of a new and specific historical awareness" (Pollock, 2007: 366). Possibly, this particular kind of historical awareness produced a crop of fresh works with a distinct quality of incisiveness and energy. Major disciplines of knowledge during that period were logic-epistemology (*nyāya*), moral-legal discourse (*dharma*), hermeneutics (*mīmāṃsa*), and linguistics (*vyākaraṇa*). Next important development occurred through vernacularization in specific literatures and genres. This appears to have been especially true of medical writing. As these changes continued, newly developed modes of

reasoning were for the first time contrasted in *favorable* terms with earlier and formerly sacrosanct classical traditions.

The late sixteenth century saw the composition of such critically influential medical works as Bhāvamiśra's encyclopedic *Bhāvaprakāśa*, Ṭoḍarmalla's *Ṭoḍorānanda*, the *Rājanighaṇṭu* (the largest extant lexicon of Indian *materia medica*), Lolimbarajā's *Vaidyajīvana*, and Harṣakriti's *Yogacintāmani*. A cursory examination of any manuscript library in India reveals scores of copies of these works, which were energetically copied, distributed, and studied throughout the subcontinent. Printed editions of the first two of these works are in wide circulation and use in India even today, in traditional medicine colleges and clinics.

The seventeenth century continued the rich production of medical texts, including those of Trimallabhatta (resident of Benares, who incidentally provided unique information on the discounted prices available physicians on raw and prepared medicines), as well as the several works commissioned by Mahrājā Anūpasiṃha of Bikaner (whose personal manuscript library remains one of the finest research resources in India today).(Pingree, 1970-1994)

The other authors of that period who are worthy of study include Bharatamallika (who wrote on genealogy of the medical families of Bengal), and Praharāja (who wrote a medical text in the completely novel form of a dramatized dialogue between husband and wife). Several medical works were created under the patronage of Maratha dynasty of Thanjavur in South India. These include, for example, the three medical compositions of Raghunātha Paṇḍita, a prolific author who also wrote in other genres and languages. Even Nāgeśabhatta, arguably the most famous Sanskrit intellectual of seventeenth/eighteenth century India, appears to have composed a medical treatise, the still unpublished *Mañjuṣaśekhara*. Wujastyk in his essay "Change and Creativity in Early Modern Indian Medical Thought" has drawn attention to *Rogārogavāda* by Vīreśvara (written A.D. 1668/1669) (Meulenbeld, HIML, IA: 328), who raised his dissenting voice against the established medical authorities. (Wujastyk, 2005) Wujastyk finds, "In short, Vīreśvara attempts to mount a serious challenge to the foundational doctrines of classical medicine...Though, it should be noted, Vīreśvara is not the first medical author to engage in theoretical polemics. Naraharibhaṭṭa's *Vāgbhaṭakhaṇḍana* (after the mid-thirteenth

century (Meulenbeld, HIML IA, 676 f.) is a work defending Vāgbhaṭa's *Aṣṭāṅgahṛdaya* against the attacks of critic called Sauravidyādhara. And an old tradition of medical debate is very evident in the earliest saṃhitās of Caraka and Suśruta." (Wujstyk, 2005: 107)

The eighteenth century witnessed, apparently for the first time, the emergence of a new linguistic situation in which medical authors began to develop literary discourses which spanned more than one language. In this, and so far as currently can be told of, medical writing seems to differ from several of the other disciplines of Sanskrit intellectual life. So, for example, Diler Jang composed in both Sanskrit and Persian, Mahādevadeva wrote two works introducing Islamic medicine to a Sanskrit-reading audience (including many items of Perso/Arabic vocabulary). Vyāsa Keśavarāma composed a bilingual Gujarati-Sanskrit medical glossary (and referred to Persian medicine), and Mahārāja Pratāpasiṃha of Jaipur wrote in Marwari, and then translated his own work into Sanskrit verse and Hindi prose (incidentally distinguishing five new types insanity). The production of medical literature in Thanjavur also continued energetically, with the Mahārājas themselves beginning to compose texts. This period is marked by growing awareness of foreign medical traditions in India: Raṅgajyotirvid mentions English operations for piles, as well as naming several contemporary physicians. Govindadāsa introduced a number of medical innovations, and also referred to contemporary physicians and their views.

These last authors illustrate the point that it is possible, in this period of Indian intellectual history, to attempt to integrate a history of ideas with a history of the history of the social processes which shaped the production and transmission of those ideas. The medical literature of earlier centuries is notable for the absence of the proletarian tracts, medical handbooks aimed by their learned authors at householders rather than fellow medical professionals. But on the eve of colonialism, processes of vernacularization begin to sweep through the production of medical literature. Now, the obvious question comes up: is vernacularization the same as proletarianisation? Is a new sociology of medical practice developing? Or is new class of consumers evolving who are reading in the vernacular, but are nevertheless privileged socially?

It is possible that in the complex of ideas concerning the use of Sanskrit versus the vernacular, and of public versus privileged knowledge, lie materials which may help us to begin answering the question of why the relentlessly negative criticism of Indian intellectual life by the Anglicists met with absolutely no response from within the traditional intellectual establishment. Another modality of intellectual activity that grows more noticeable during this period chosen for study is polymathy. A number of high-profile medical authors produce virtuoso works of scholarship in non-medical fields. Raghunātha Paṇḍita, for example, composed treatises on poetics and metrics. What does this say about medical thought and practice? Do leading scholars believe that they have a set of intellectual tools and discourses that can be applicable to all subjects? Is there evidence that the medical practice of the time is losing its roots in *empirical practice*, and becoming a *theory-laden recreation for intellectuals*?

It would be profitable to note that adhering to the practice of writing new texts based on classical ones is evident even in the late-eighteenth or early-nineteenth century text *Abhinavacintāmaṇi*. Jan E.M. Houben has critically read and explained the text. (Houben, 2007) Houben observes, "In fact, the AC seems remarkably "classical" in its approach, in spite of the exchanges with other systems and developments in medical knowledge contemporaneous with the author." (Houben, 2007: 85) It contrasts with the view taken by Sheldon Pollock. (Pollock, 2002) More evidence can be adduced here. Brian Hatcher and Michael Dodson refute the very concept of paradigmatic rupture of classical medical learning as put forward in the *Sanskrit Knowledge-Systems Project on the Eve of Colonialism* under the stewardship of Sheldon Pollock.(Hatcher, 2007) "On the Eve of Colonialism" was specifically remarkable for *vernacularization* of Indian classical texts and not, to emphasize, *experimentation.*

This last question is of great importance for the present dissertation. As has been seen before the sheer lack of anatomical knowledge and the binding of *śāstras* over finding out new vistas for innovative practices were impeding to the development of medicine in India in any new direction. Combined with the impact of *śāstras* this particular observation related to being bereft of empirical practice and being heavily theory-laden posits a serious question to take into consideration. Here a quote from

Mādhava Kar (assumed to be of 8th century A.D.) should be helpful. He is said to have lamented – *nānā tantrabihīnāṃ bhiṣajālpa medhasāṃ /*

sukhaṃ vijñātumatanca mayaneva bhabiṣyati // ["This very (book) will enable physicians, lacking various treatises and possessing little intelligence, to discern a disorder with ease."] (Meulenbeld, 2008a: 29)

It is self evident from the statement that during the period of Mādhava, general quality of āyurvedic practitioners had declined.

Now, coming to the previous questions, concurrently with the spread of European power in the mid-eighteenth century, the dynamism and creativity in medicine, as well as other fields, began to diminish. By the end of the century, the tradition of Sanskrit systematic thought, which for the two millennia or more had constituted one of the most remarkable intellectual formation in world history, vanished as creative force in Indian life, to be replaced by other kinds of knowledge based on different principles of knowing and acting in the world. "No idiom was developed in which to articulate a new relationship to the past, let alone a critique; no new forms of... could be conceptualized." (Pollock, 2001: 417) It is to remember that disintegration Mughal Empire and other social forces that had so long sustained Sanskrit practice produced a vacuum, which was later filled in, by the European powers and, finally, the British. The consensus today seems to be that European traders operated on a basis of equality with their Asian peers, and indeed often partners, until some time in the later eighteenth century. Then, the beginnings of the Industrial Revolution in Europe, really England, began to be felt, and this translated into the displacement of 'traditional' Asian trades by Europeans who until this time had been in no way remarkable or dominant. (Pearson, 1995: 142) Later European traders had acquired military edge over their Asian rivals. "A dramatic specific example is what the Dutch did to cinnamon prices once they had gained control of the coastal areas of Sri Lanka in I659. The price had been 15 stuivers a pond. They immediately raised it to 36, and in I660 to 50." (Pearson, 1995: 143) European superiority included not just technological advances, but also the intellectual and scientific developments which made possible the technology and so the Industrial Revolution. "Among these were changes in medical theory and practice, and in the medical profession." (Pearson, 1995: 144)

European experience of the same period may be compared here. When Thomas Willis began his Sedleian lectures, he ignored the required exposition of Aristotelian science, instead emphasizing the medicine he studied and practiced. Study of the circulation of experimental animals was difficult in the beginning because vascular access was limited by blood clotting and primitive equipment. Willis wrote in his classic monograph, "*Cerebri anatome* (1664), But for the more accurate accomplishment of [dissection] I had not sufficient leisure, and perhaps, not sufficient ability...I employed...Richard Lower, a doctor of outstanding learning and an anatomist of supreme skill... enabled me to investigate better both the structure and functions of bodies, whose secrets were previously concealed." (Felts, 2000: 420) Anatomy was, of course, the first 'science' that needed human body parts for study, although much of the early work that the Greeks, and then Greco-Romans, did on the structures of bodies was done on animals considered analogous to humans. The study of human gross anatomy changed in the fourteenth century, with the occasional demonstration of the interior parts of the body on the corpses of criminals. It is important to stress here that until the 'solids' (organs, etc.) were seen as significant locations of normal and pathological processes for which some therapy could be devised most practitioners considered that intensive attention to the details of human structure was nearly irrelevant to clinical practice and "the academic study of anatomy for elite practitioners expanded in sixteenth-century Italy..." (Lawrence, 1998: 124) Even as late as 1811, while doing 'experiment' with diabetic urine Dr. William Henry remarked, "The nature and amount of the *primary animal fluids* (as they have been termed by Dr. Bostock) which are contained in diabetic urine, can scarcely, I apprehend, be determined..." (Henry, 1811: 135) It is understood that the legacy of humoral theory looms large in 1811 when scientific experiments were being carried out in rigorous manner.

In fact the term for muscles, *mys*, is used very rarely, and significantly, only by medical writers who themselves regard it simply as a particular type of flesh. The Hippocratic authors of these treatises, it is fairly certain, did not perform dissections. Their descriptions of internal anatomy are, for the most part, speculative. "The author of *The Sacred Disease*, for instance, wrote that there were four main sources for the humours in the body: the heart, the head, the liver and the spleen." (Shanks, 2002: 63)

These are all connected, he contended, to the stomach through channels. This account reflects a concern, not for *accurate anatomical description*, but for *theoretical unity*. "With the emergence of dissection in the fourth century, references to muscles in the sources increase dramatically. While the term *mys* appears only 14 times throughout the whole of the Hippocratic Corpus; Galen used it over 460 times in his writings." (Shanks, 63) It should be noted that cultures with a long tradition of animal sacrifices and of embalming their dead have notoriously inaccurate systems of anatomy. Ancient Egypt, for instances, where embalming was first extensively performed, had an anatomical tradition which consisted of the heart and forty-four hypothetical vessels located throughout the body, which obviously bears little resemblance to the actual interior of the human body.

Quaisar has aptly noted this characteristic in Indian context. He observes, "the scientific delineation of muscular projections of human or animal figures was beyond the grasp of Indian artists since they did not possess the experience of observing *dissected bodies* with trained eyes." (Qaisar, 1998: 136)

With this background we may now proceed to know how the foreign travelers to India perceived of India and its culture, medical practice and so on.

II India through the Eyes of Travelers

When two culture groups come to meet each other differences in language, custom and culture tend to present an understandable barrier to a deep and meaningful process of mutual appreciation or cultural exchange. Each culture appears to borrow selectively. To Narasimha "it is fascinating to consider the inverse question of what the different cultures did not borrow (perhaps even refused to borrow) from each other, in spite of close contacts over centuries." (Narasimha, 2007: 522) This particular question of selective borrowing had cast a deep impact on Indo-European exchange of knowledge, almost all the time in an asymmetrical way. The leverage was tilted towards the European end. It has been nicely summarized by Meulenbeld, "The renaissance of āyurveda since about the middle of the nineteenth century ... in the competitive struggle with Western medicine ... led to the construction of a unitary and coherent model of Indian medicine, weaned from inconsistencies and untenable concepts, and, particularly, as free from

magical and religious elements as possible...The ancient terms for physiological and pathophysiological processes, nosological entities, etc., were diligently re-interpreted to bring them into line with terms derived from Western medicine." (Meulenbeld, IA: 2)

Very often foreign observations become superficial or biased, even to the point of being harsh without comprehending the ingrained strength of another culture. Despite this a number of foreign travelers – a good number being medical professionals by training – came to visit India during the period concerned. Kapil Raj has convincingly argued that the sought-after natural-historical objects and knowledge were directly accessible to the travelers. The whole process of collecting nature "was akin to present-day space engineers programming planetary probes in order to retrieve relevant information from hostile environments." (Raj, 2006: 28) These travelers may be regarded as the harbingers of full-scale process of colonization. Many European men of science were well aware of this aspect. "They also included specific 'Enquiries about Traditions, concerning all particular things relating to [each] Country, as either peculiar to it, or at least uncommon elsewhere.'" (Raj, 2006: 29) It was directed to 'enquire' into 'Physick, Surgery, or Dying, etc. (Ibid, 29) What, for a start, then were 'European' and 'non-European' precepts of Knowledge in the early-modern world? Kapil Raj cites an example of a French traveler Nicolas L'Empereur. L'Empereur came to Surat in Gujarat. A couple of years later he elaborated his scheme, "This work will be of considerable size and, once printed, nothing [of Indian medicine] will be left unknown to the European surgeon." (Raj, 2006: 36)

In Hiuen Tsang's account of A.D. 629 there is no mention of anatomical or surgical practices. In his description, at the age seven years an upwards, "the young are instructed in the five *Vidyās*, *Śāstras* of great importance." (Beal, 1884, Vol. I: 78) The third is called the medicinal treatise (*Cikitsāvidyā*). It embraced "formulae for protection, secret charms (*the use of*) medicinal stones, acupuncture, and mugwort." (Beal, 1884, Vol. I: 78) According to him, Indian medical treatment is primarily based on balancing the body by abstinence from food and other herbal remedies. "Every one who fails sick fasts for seven days. During the interval may recover, but if the sickness lasts they take medicine...The doctors differ in their modes of examination and treatment. (Ibid, 86) Another Chinese scholar and traveller I-Tsing (A.D. 671-695) provides quite good account of contemporary Indian medical practice. He too describes medical practice as

being centered on fasting and setting the balance of the diseased body through various dietetic and herbal remedies. Only once he mentions of some rudimentary surgical practice, "Cauterized with fire or with a puncture applied, *one's body* is treated just as wood or stone; except by the shaking of the legs and moving of the head, the sick differs not from a corpse." (Takakusu, 1896: 129) There is also elaboration on the Buddhist doctrine of health and disease.

During the seventeenth and eighteenth centuries "Physicians were scholars and so to be found only in centres of learning. Surgeons were low-status craftsmen, and more widely available." (Pearson 1995: 148) Though sometimes it is said that the Europeans, the Hindu and the Muslim differed among themselves too much in their habits and outlook to have any great attraction for one another, but at first there was no trace of race feeling or any talk of superiority and inferiority. "Foreign travelers like Pelsaert, Bernier and Manucci noticed and commented on the many shortcomings in Indian society and government but none of them had any objection to mixing freely with Indians, living in their midst, or even accepting service under them." (Sastri, 1964: 137)

A great number of medical men and travelers coming to India were quite vociferous while talking about absence of anatomical knowledge among Indian people. To keep in mind, some superficial adulatory remarks were also found sometimes – "Many surgical operations which we consider triumphs of our modern practice were invented by the ancient Hindus...had specialists in *rhinoplasty* or operations for restoring lost ears and noses." (Bedroe, 1893: 117) Though, in reality, the period was marked by a proliferation of compendia, perhaps, mistaken for new scientific achievements. (Bala, 1991: 33)

François Bernier (1625-1688) was for 12 years the personal physician of the Mughal emperor Aurangzeb in India. He wrote *Travels in the Mughal Empire*, which is mainly about the reigns of Dara Shikoh and Aurangzeb. He stayed in India for 15 years and in 1669 he left India for Paris. Regarding the difference in nature of disease in India and Europe he wrote, "Even the venereal disease, common as it is in *Hindoustan*, is not of so virulent a character, or attended with such injurious consequences, as in other parts of the world." (Bernier, 1916: 254) He was eager to transmit recent innovations and knowledge in Europe to his companions. "When weary of explaining to my *Agah* the

recent discoveries of *Harveus* and *Pecquet* in anatomy, and of discoursing on the philosophy of *Gassendi* and *Descartes*, which I translated to him in Persian (for this was my principal employment for five or six years) we had generally recourse to our *Pendet...*" (Bernier, 1916: 323-324) While he was energetic to pursue this sort of work he was also scrutinizing Indian knowledge world in his own way. "On physic they have a great number of small books, which are rather collections of recipes than regular treatises. The most ancient and the most esteemed are written in verse. I shall observe, by the way, that their practice differs essentially from ours, and that it is grounded on the following acknowledged principles: a patient with a fever requires no great nourishment; the sovereign remedy for sickness is abstinence..." (Ibid, 338) He comments here, as expected, as an expert physician. Further, "a patient should be bled only on extraordinary occasions, and where the necessity is most obvious as when there is reason to apprehend a brain fever, or when an inflammation of the chest, liver, or kidneys, has taken place." (Ibid, 338) He notices, "The *Mogols*, it is true, are rather more given to the practice of bleeding than the *Gentiles*; for where they apprehend the inflammations just mentioned, they generally bleed once or twice, not in the trifling manner of the modern practitioners of *Goa* and *Paris*, but copiously, like the ancients, taking eighteen or twenty ounces of blood, sometimes even to fainting; thus frequently subduing the disease at the commencement, according to the advice of *Galen*, and as I have witnessed in several cases." (Ibid, 338-339) Why do such differences occur in treatment? Bernier it lies in the *Gentiles*' (or Hindus) education. "After the *Purane*, some of the students apply their minds to philosophy, wherein they certainly make very little progress." (Ibid, 336) Not only that both Hindus and Muslims are lacking in the knowledge of anatomy and experimenting bent of mind. It is the very fact due to which they are deficient in therapeutic superiority. "It is not surprising that the Gentiles understand nothing of anatomy. They never open the body either of man or beast, and those in our household always ran away, with amazement and horror, whenever I opened a living goat or sheep for the purpose of explaining to my *Agah* the circulation of the blood, and showing him the vessels, discovered by *Pecquet*, through which the chyle is conveyed to the right ventricle of the heart." (Ibid, 339) Not only that Bernier finds, "Yet notwithstanding their profound ignorance of the subject, they affirm that the *number of veins in the human body*

is five thousand, neither more nor less; just as if they had carefully reckoned them." (Ibid, 339)

It must be noted that while Bernier is interested in transmitting anatomical knowledge through practical dissection of animals Indian people are frightened by the sight of it. Again, when he talks about anatomical structures and achievements of Harvey or Pecquet or Descarte Indians tell stories of Puranas. So, it is understandable that there lies an undertone of European superiority in these accounts and those too based on modern scientific knowledge of the body. Moreover, he observes that the profession of medicine is a family art and business. It is not profession per se, as in Europe. "The embroiderer brings up his son as an embroiderer, the son of a goldsmith becomes a goldsmith, and a physician of the city educates his son for a physician. No one marries but in his own trade or profession; and this custom is observed almost as rigidly by *Mahometans* as by the *Gentiles*, to whom it is expressly enjoined by *their law*." (Bernier, 1916: 259)

The role of *śāstra*, as has been previously noted, is testified in this account of Bernier. And as a result of all these things taken together European Physicians like Bernier was esteemed high even by the kings. "DĀRĀ SHĀH, having learnt that an accomplished European physician was at hand, sent immediately for him, and Monsieur BERNIER went to his tent, where he saw this lady and examined into her ailment, for which he gave a remedy and quick relief. This poor Prince, being much pleased with Monsieur BERNIER, strongly pressed him to remain in his service..." (Ibid, 90)

Manucci's accounts also substantiate this fact, "I knew from experience that Frank physicians are held in esteem by the Mahomedans." (Manucci, 1907, Vol. II: 90) The attitude of Indians to European skill in medical science is interesting. While physicians did not believe or admit that European doctors were properly acquainted with medicine, the masses held a different opinion "as soon as any Farangui arrives at a place and it becomes known, they (Indian people) at once bring up sick, all kinds of diseased persons coming to consult..." (Qaisar, 1998: 16)

In Fryer's account, "They are unskill'd in Anatomy, even those of *Moors* who follow the *Arabians*, thinking it unlawful to dissect human bodies...Pharmacy is in no better condition..." (Fryer, 1912, Vol. I: 287) He also notes, "Custom and Tradition are

only Venerable here; and it is Heresy to be wiser than their Forefathers..." (Fryer, Vol. I: 180) He goes on, "Chirurgy is in a bad plight, Amputation being an horrid thing... They pretend to understand the Pulse, but the Urine they will not look on." (Fryer, Vol. I: 287) Finally, he makes an important comment, "But I believe rather we are here as Exotick Plants brought home to us, not agreeable to the Soil." (Fryer, Vol. I: 180)

Bernier, Manucci or Fryer was not the only one to show that in the area of surgery a perception of a pronounced gap had appeared between India and Europe. Garcia d'Orta in Goa in the mid-sixteenth century was the first, but by no means the last, European doctor to be critical of Indians' anatomical knowledge: "As for anatomy, they do not know where the liver is, nor the spleen, nor anything else." (Markham, 1913; quoted in Pearson 1995)

John Fryer gives another important account. He was a medical graduate from England. He served as a surgeon in the East India Company for nine years from 1672 to 1681 and traveled extensively on the Coromandel and Malabar coasts. He describes the life and trade of Bombay, Surat, and Madras. His account is valuable for its commentary on natural history and medicine. He found '*Bengal* Juglers' and others to show magic. One magician "by Suction or drawing of his Breath, so contracted his lower Belly... as by the most accurate Dissection could be made apparent... The Aetiology whereof I think to be this; that while all the contents of the Belly are moved upwards, all Respiration is expelled, only the voluntary Motion of the Animal Spirits act upon the Nerves (the Mind or Soul commanding them) while the Vital or Natural are compelled to the contrary." (Fryer, Vol. II: 103) Terms like "suction", "accurate dissection" or "voluntary motion" are more specific technical-scientific terms to describe a magic show which the Indian people observe with awe. Fryer finds, "In esteem among them are principally Magick and judicial Astrology... Elocution, Physick, Metaphysicks, are not out their element: Their Philosophers maintain an *Aristotelian* Vacuity; nor are they quite ignorant of Medicks, though *Anatomy is not approved*, wherein they lean too much on Tradition, being able to give a very slender account of the Rational Part thereof." (Fryer, Vol. II: 103) In this observation "Anatomy" has been juxtaposed to "Tradition" and near-absence of "Rational Part" thereof. Anatomical perception of the human body was the basic issue of Fryer's account, while it was the extra-scientific puzzle that pervaded Indian observation.

Fryer also noted, "Custom and Tradition are only venerable here; and it is Heresy to be wiser than their Forefathers..." (Fryer, Vol. I: 180) In his opinion "Physick here is now as in former days, open to all Pretenders; here being no Bars of Authority, or formal Graduation, Examination or Proof of their Proficiency; but everyone ventures and everyone suffers...They are unskilled in *Anatomy*, even those of the *Moors* who followed the *Arabians*, thinking it unlawful to *dissect Human Bodies*...They pretend to understand the *Pulse*, but the *Urine* they will not look on." (Fryer, Vol. I: 286-287) He adds, "Phlebotomy is not understood, they being ignorant how the Veins lye; but they will worry themselves Martyrs to death by Leeches, clapping on an hundred at once, which they know not how to pull off..." (Ibid, 287)

Though too rigid and harsh this account may sound to us it is undeniable that Fryer's observation tallies Bernier in some points – (1) professional education is family based, it does not have any standard, formal and uniform educational structure, (2) anatomy is the most neglected subject, and (3) both are talking from superior position, at least from the position of a medical professional. Fryer comments, "But I believe rather we are here, as *Exotick Plants* brought home to us, not agreeable to the Soil..." (Ibid, 180)

To remember, there is also mention of Indian surgical knowledge in other accounts. Manucci was possibly the first person to give a somewhat detailed account of Indian rhinopalsty. "The surgeons belonging to the country cut the skin of the forehead above the eyebrows, and made it fall down over the wounds on the nose...In a short time the wounds heal up...I saw many persons with such noses, and they were not so disfigured as they would have been without any nose at all..." (Manucci, 1907, Vol. II: 301) Rhinoplasty may be regarded as a regular practice as Manucci saw many people undergoing this operation. Lambert observed, "An obstruction of the spleen...They make a small incision over the spleen, and then insert a long needle between the flesh and skin. From this incision, by sucking thro' a horn pipe, they obtain a certain pinguous matter which resembles pus." (Lambert, 1750, Vol. I: 99-100)

Against this background the state of medical knowledge on the eve of colonialism can now be addressed.

III Specificity of Āyurvedic Knowledge on the Eve of Colonialism

"Contacts between Āyurveda and Western medicine began in the sixteenth century." (Meulenbeld, 1995: 8) Meulenbeld informs, "The Westerners, from their side, introduced new plants into India, of European and South American origin, several of which were of medicinal value. As a result new drugs were incorporated into Indian pharmacopoeia." (Ibid, 9) It yielded some unwanted effects on the study of Indian medicinal herbs. As new medicinal plants were introduced under old names "the originally employed botanical species passed into oblivion." (Ibid, 9) There were perceptible changes in Indian nosology. But all these had little or no impact on anatomical knowledge in Āyurveda. "By the seventeenth century, Indian students who chose to specialize in medical studies were being exposed to a tradition of sophisticated medical reasoning and theory almost two thousand years old...and these works brought together not only treatises on anatomy, including embryology, diagnosis, surgery, epidemics, pharmacology, and so forth, but also a philosophy of the origin of the human being, the rules of medical debate, rules on technical terminology and interpretation, and other "meta-medical" materials." (Wujstyk, 2005: 101) The later history of Sanskrit medical literature is a mixture of further works of grand synthesis and the proliferation of works on specialized topics and manuals for the working physician. A notable absence in the literature seems to be manuals for use in the home or by untrained practitioners, a genre that was important, for example, in China. Here we may again be seeing the power of social exclusion implied in the use of the Sanskrit language. However, by the seventeenth century, thousands of Sanskrit medical treatises were available for study by Sanskrit-knowing physicians. (Ibid. 101)

All these were synthesized in the early seventh century A.D. into the great work *Aṣṭāṅgahṛdaya* by the Sindhi author Vāgbhaṭa. This work became the textbook *par excellence* for classical Indian medicine. Though Hoernle comments on this work regarding its detailing of human skeleton and number of bones, "The fact is interesting, because it shows that the text of the Compendium of Suśruta, on which Vāghbhaṭa I based his anatomical theories, was already in his time in a corrupt state...Vāghbhaṭa I possessed no experimental knowledge of the skeleton...from want of anatomical knowledge he was unfitted to use critically." (Hoernle, 1994: 96) Wujastyk adds further,

"Three very different Indian medical works, composed in the sixteenth and seventeenth centuries, may serve as examples of the kinds of literature that were being created at that period, and of the types of ideas that were circulating amongst medical intellectuals with whom Fryer so singularly failed to make contact. One of these works was extremely popular, the other two relatively rare, and it is interesting to speculate on the reasons for the different receptions of these works." (Wujstyk, 2005: 102) As has been discussed earlier, Vireśvara's work is supposedly an anti-authoritarian work. In complete contrast to Lolimbarāja's *A Doctor's Livelihood* it stands as a short polemical tract that seeks to engage intellectually with the principal doctrines of classical Indian medicine, and to completely overthrow them: the *Rogārogavāda* or "Debate on Illness and Health". "The author, Vīreśvara, tells us that he composed the work in 1669 (shortly after Fryer left India), and that he was a resident of the ancient provincial town of Kāyatha, near modern Udaipur in Rajasthān." (Wujstyk, 2005: 107) For all his bluster and arrogance; Vireśvara has indeed produced an unusual and interesting work. He systematically takes the principal theories of pathology in classical medicine, and refutes them one by one. Thus, he deals with humoral imbalance, diseases caused by bad *karma*, accidents, secondary diseases, hereditary diseases, birth defects, contagion, and corruptions of the humours and the body tissues. "For example, Vireśvara points out a fatal contradiction in the classical theory of humoral disease as follows. The greatest authorities define disease as identical to an inequality in the humours. And yet, in other places they say that the humours may naturally exist in different quantities, without causing illness, such as when phlegm naturally predominates at the start of the day, or after a meal. This is not to say that one is always ill after a meal. And so the central doctrine that humoral inequality is identical with disease must be wrong." (Ibid, 108) Finally, Wujastyk concludes, "In short, Vireśvara attempts to mount a serious challenge to the foundational doctrines of classical medicine. His challenge may appear quixotic, but it is nevertheless offered in a spirit of intellectual rigour and debate which speaks of an original if impulsive mind." (Ibid, 108)

Despite Vireśvara's attempt to dislocate the authority of ancient texts by questioning the centrality of classical theory of humoral diseases he could not attain much attention from the contemporary world of Sanskrit scholars in general and medical professional in particular. He was also not much accepted by the general population at

large. It is supported by the fact that only 4 manuscripts of him are surviving till date. There may remain a number of reasons behind this. It may be due to specific conceptual framework of Indian mind – to rely on *āptopadeśa*, not to question the authority. It may also be due to the fact that he actually did not give any alternative paradigm to think of. If this paradigm, it may be conjectured, had been built on concrete reality of anatomical studies it might have been able to ground his reasoning and observation on some definite and alternative explanatory model.

Cakrapāni-Dāsa's *Abhinavacintāmaṇi* is another work of precolonial world, as discussed earlier. (Houben, 2007) Houben clarifies his position as to why he takes up this text for study – "in the first place because the classical canon is transmitted and even fashioned by processes taking place in later periods, and, second, because these relatively little studied later phases of the knowledge systems prepare the stage for the momentous transitions in cultural and intellectual life that set in when India is overtaken by colonial powers, from end 18th till early 19th century onwards." (Houben, 2007: 64) In view of the date of the AC (*Abhinavacintāmaṇi*) and the historical phase that can be assumed for Āyurveda and medical knowledge and practice at that time, two questions appear: (1) whether, and, if yes, to what extent, this text participates in the new developments in India, and (2) to what extent it participates in the "post-classical" (post-Aṣṭāṅgahṛdaya) tradition of Āyurveda of more than a millennium.

A little more acquaintance with the text of AC will help us to get at the point. "Perhaps the diseased person is the twelfth principle, as the chapter contains a longish section entitled *rogī*[sic]-*parīkṣā* after previous passages devoted, one by one, to *kāla*, *deśa*, ... up to *vyādhi*." (Houben, 2007: 74) Then AC in the fourth chapter "deals with *nāḍyādi-trayodaśa-tat*[*t*]*va*, "the thirteen principles 'pulse' etc." which concern first of all the examination of the patient or *rogī-parīkṣā*." (Ibid, 74) Houben finds that the AC may be an example "where we find an approach that is in rationality and pragmatism hardly different from that found in classical texts such as the Caraka-saṃhitā." (Ibid, 75) Only exceptions occur in the use of consecrating plants or mentioning treatment of relatively new diseases like *māsurikā-roga*. [To note, since the fifth century in any case Caraka's work had already acquired a solid, authoritative status, as is clear from a reference to and quotation from Caraka's work in Bhartrhari's Mahābhāṣya-dīpikā.]

Houben comments, "Although with hindsight we know that in 1799 Orissa and India were very close to complete dominance by the British and for instance the Ganjam district was already British there is no reflection of the presence of Europeans in the AC; they seem to have remained outside the perspective of our author." (Houben, 2007: 82) On the basis of the overview some results can be spelled with regard to the problematics referred to at the beginning. Unprecedented and apparently irreversible developments had already started to influence the political, social and cultural conditions in the subcontinent and in the area of the author. It is not known how large an area the author considered his own, or which area was referred to as *sva-jananī* (used in a verse of AC), it may have been equivalent to Orissa or to one of its districts, or to the entire Indian subcontinent. Houben asks, "Does the AC show any signs of the "early modern" times that should have started more than a century before our author?" (Ibid, 84) In his answer Houben, perhaps, clinches one of the most vexing questions of precolonial knowledge world, "In fact, the AC seems remarkably "classical" in its approach, in spite of the exchanges with other systems and developments in medical knowledge contemporaneous with the author. In some respects the AC is perhaps more "classical" than some of its predecessors. For instance, a description of *phiraṅga-roga* (syphilis) which was a new element in the sixteenth century Bhāva-prakāśa is not found in the AC." (Ibid, 84) To speak of a lively tradition seems appropriate with regard to the AC, but this text does not suggest a "dynamic era of intellectual inquiry" within Āyurveda in this corner of the Indian subcontinent. Such is the observation of Houben. Contesting Pollock's finding he comments, "nor is there a trace of a "creative reinvention of the world of South Asian thought in the late precolonial period" which has been felt to have taken place in other sanskritic disciplines and knowledge systems (Pollock 2004: 21)." (Ibid, 85) Here Houben refers to Sheldon Pollock (2004: 21)

The creativity within Āyurveda to which Wujastyk (2005) refers (from the sixteenth century onwards) has not been shown to set this period off very clearly from earlier periods, but it demarcates it from the colonial period that was to follow. Whereas momentous changes had taken place in political, social and cultural circumstances from the sixteenth to the eighteenth century, it seems that in Āyurveda the tradition remained, relatively, internally dynamic and self-sufficient. The AC fits into this picture.

IV Conclusion

Some issues should be taken for quick appraisal. "From 1500 to 1700 the clear dominance of Nyāya, with 97 exponents, followed by Advaita Vedānta thinkers, forming a close second...The period from 1700 to 1900 is marked by a continued dominance of Nyāya and Advaita Vedānta on the Indian philosophical scene." (Krishna, 2006: 40) It can be deduced that in such an environment of theoretical debates and interpretations and re-interpretations of ancient philosophies without having any recourse to practical experimentation lead to some additive theoretical understanding, not the actual knowledge of material world nor that of the body. From Wujastyk an example can be cited. (Wujastyk, 2009)

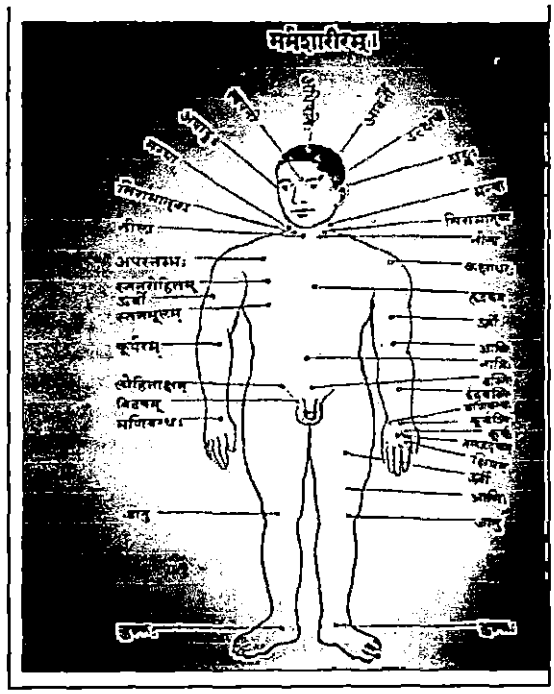


Fig. 12

[The *marmans* on the front of the body, from Kiñjavaḍekara 1938.40: facing śā.53. Wellcome Or. P.B.Sansk.702. Reproduced courtesy of the Wellcome Trust.]

Another picture of about two centuries ago can be reproduced here.

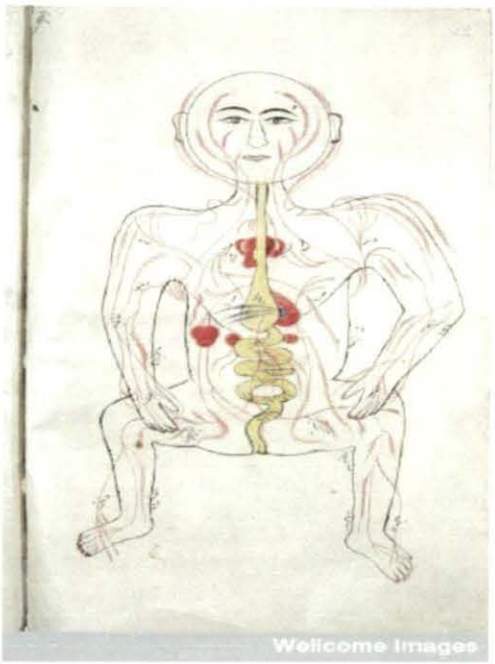


Fig. 13

[Anatomical illustration of the human body showing arteries and viscera. From a manuscript attributed to Shikastah-Nastaliq (calligraphic hand). Drawing; 18th century **From:** Oriental Manuscript WMS.Per.449 Collection: Asian Collection Library reference no.: Or WMS.Per.449

To note, anatomical organs are not illustrated here according to their localization inside the body.]

However, that is not all. A very influential medical book in sixteenth-century Europe was Jean Gavinet's 'The Directory of Astrology made Medical,' written in I43I and passing through five editions between 1496 and I614. Pearson comments, "This reliance on astrology points to a more general matter. It can be heuristically useful to distinguish three foci in medical practice, namely care, cure and causation. In this early modern period one could argue that the emphasis was on care; studies of cure, let alone cause, at this time were still primitive, having as much to do with astrology and malignant forces as with science." (Pearson 1995: 148)

Moreover, "The Salerno Regimen of Health," published in I480 but first written in the late eleventh century in Salerno, which went through no less than 300 editions. Also contributing to the long survival of these pre-modern notions was the fact that very

few people had access to medical care. Physicians were scholars and so to be found only in centers of learning. Surgeons were low-status artisans, and more widely available. (Pearson, 1995: 148) As late as the 1830s, there was a bleeding craze in France and some 20 million leeches a year were required to keep up with the demand. A connection between bodily cleanliness and good health began to be accepted only in the nineteenth century. (Ibid, 164) But, in European context, advances in knowledge were accompanied by improvements in professionalism. As we have seen before in a number of instances European surgery was esteemed in India even during the period under consideration of this chapter. This new prestige for European surgery seems to have spilt over into the beginnings of an influx of western medical ideas into India. This could, however, be a double-edged sword, for one instance from the 1720s shows Indian doctors adopting bleeding with great enthusiasm. Bleeding has not been used so frequently in āyurvedic medicine as in European medicine, but in 1726, we are told that it was now very widely used by pundits. One used to bleed his patients up to twenty times. Such ferocious treatment was now less common in Europe, and indeed it appears that European patients were no longer prepared to tolerate this sort of treatment, for the French doctor added regretfully that this pundit could do this 'sans que les malades en murmurent, etant bien plus obeissans aux ordres de leur Medecin qu'on ne l'est en France.' (Ibid, 170)

Zaheer Baber cites evidence to show the presence of a distinct occupational category or 'profession' as early as the sixteenth century. "By the sixteenth century, the practice of medicine had also become established as a semi-independent occupation, and the practitioners were paid for their work." (Baber, 1998: 81) Following British colonialism and consolidation of its power everything went upside down. Pearson notes, "The accepted sequence, very crudely, is that for at least 250 years the Europeans did not represent an economically and technologically more advanced civilization than the ones they saw in Asia. Only with the Industrial Revolution late in the eighteenth century did a disparity in terms of power appear between Asia and western Europe." (Pearson, 1995: 170) As we have seen in this chapter huge number of manuscripts was being produced during this period on the eve of colonialism. But manuscript culture soon had to face the aggression of print culture. The missionary newspaper, *The Friend of India*, wrote, "Printed books will gradually constitute a powerful source of influence... Works... within

the last ten years are indications of improvement...if we consider the darkness and ignorance of the community among they have found patrons." (Butalia, 1993: 220)

In the next chapter, we shall try to explain how this change took place in all spheres of medical practice and how anatomical knowledge played the key role in this transformation. It may be useful to remember, "Unknowingly and unwittingly they (the British) had not only invaded and conquered a territory but, through their scholarship, had invaded an epistemological space as well." (Cohn, 2004: 53) Military metaphor like 'invaded' is the right term to employ here. (Otis, 1999) There was fierce epistemological struggle between conquering and subjugating Indian knowledge on the one hand, and putting resistance against it on the other.

Chapter 3

Arrival of Western Medicine: Colonial Reconstruction of Medical Knowledge

I Introduction

II Characteristics of Western Medicine till the Beginning of 19th Century

III Introduction of Medical Knowledge in Colonial India

IV Interface of Both Knowledge Systems and Reconstitution of Āyurvedic Knowledge

I Introduction

Edgar J. Spratling, one of the most eminent physicians of the early twentieth century America, rread before the Medical Association of Georgia at its Fifty-third Annual Meeting, Savannah, April, 1902, "Brothers, there is where our power lies...the real arbiters of the great body politic of society. And think of the social power we even now wield...The people will demand this and the law will give it; we have only to stay awake and be aggressive... Could we ask for firmer standing ground or a longer lever with which to move the world?" (Sprtaling, 1902: 1688) The quoted remark perhaps epitomizes the authority prerogative and social power a professionalized medical practice exerts over society. But such was not the case even 300 years ago. Its journey unfolds a long and tortuous path before us. That is a separate account. At this moment we should be concerned with the way 'modern' or Western medicine came into interaction with other medical traditions across the globe and how it managed to wield its transformatory power over those medical practices. In this paper our focus is on Indian medical practices, particularly Āyurveda. Our primary concern is how exchanges between India and Europe occurred and at what levels, while talking about medical encounters. In a meaningful way these two accounts reveal to us the trajectory modern medicine has traversed through last four centuries. It would also help us to understand complex interactions and various levels of exchanges that took place between indigenous and modern medical knowledge during colonial encounters. This dissertation has consistently tried to focus on the role of anatomical knowledge in the reconstruction of epistemological categories of Ayurvedic *śarīra*. However, it has been recently argued, "the search for cultural legitimacy that

characterized Indian science in the nineteenth and early twentieth centuries was displaced by an increasingly dominant discourse of scientific industrialism." (Harrison, 2005: 60) In a recent article Shruti Kapila contends that the cultural construction of science holds a mirror up to the political rationality of difference and the complexities of the idea of difference refer as much to political considerations as they refer to the cultural artifices of science. (Kapila, 2005)

Although the body has become the object of much academic work in recent decades, colonial encounters and exchange in knowledge of the body are less theorized. By examining the forms of exchange/encounter between western medical knowledge of the body and their Indian (specifically Ayurvedic) counterparts, this discursive silence may be remedied. We can rather think of the technologies of the body which, methodologically speaking, should adopt neither 'diffusionist' nor 'disseminationist' nor 'indigenist' models. To an extent, all these models speak of a triumphalist narrative, the victory march of Western civilization, or the reverse. Contrarily, medical encounters between the two different world views were informed by a dialogue between cultures rather than only imposed by the British or hailed by the 'colonized.'

The body has come to be recognized as a terrain on which struggles over control and resistance are fought out in contemporary societies. (Hancock, 2000) Kenneth M. Boyd asks, "Why do attacks of viruses count as illness, but not the attacks of larger animals or of motor vehicles? Is it just a question of size? Or of invisibility? ...Does a disease have to be something *in* me? And in what sense of 'in'?" (Boyd, 2000: 11) To reconcile opposing concepts and confusion, may be to lesser extent, the concept of disease becomes normative – where, what counts as the 'norm' is prescribed rather than statistically derived. In effect, we decide what constitutes a disease. What do we mean when we use the word 'disease' and when we use the word 'health'? Sometimes the debate seems to be merely about our use of words. Sometimes little consideration is given to the underlying biology. 'Facts' are always processed—interpreted, placed into some overarching context—whether a scientific theory or an ill person. Inextricable from context, facts must assume their meaning from a universe of other valued facts. In a sense, value is the glue that holds our world together, for knowledge is inexorably valued; it is both useless and irrelevant divorced from the reality of the personal domain. This

does not mean that knowledge is necessarily subjective, contingent, or arbitrary. Contemporary medicine prides itself on scientific accomplishment and the objective status of disease. Indeed, the distinction of scientific 'facts' and corrupting subjective 'values' represents a crucial distinction in the development of modern science. This attitude was formally introduced in the 19th century as positivism, the philosophy that purportedly separated objective pursuits from those that were neither objective nor neutral. However, the positivists' position originated earlier, with David Hume's famous proclamation that one cannot infer an 'ought' from an 'is': that a moral case cannot be deduced from a natural fact. (Tauber, 2005) Arthur Kleinman, the noted psychiatrist-anthropologist, offers an example from a report of Ralph Blumenthal's "Cries to Halt Publication of Holocaust Book" in the *New York Times* of Tuesday, March 10 1998, to show "the immense disjunction between the claims for what is supposedly known about the biological bases of human nature and what is actually known about human conditions." He concludes, "Viewed from the decidedly ordinary practices of everyday experience, human conditions certainly have a biology, but they have a history, a politics, an economics, and they reflect cultural and subjective differences." (Kleinman, 1998) Now the question of human experience comes up. It is true, no doubt, that there is a lot of confusion about the notion of experience. Following Bacon, experience may be of two types – be it 'ordinary experience' or 'ordered experience'. Unlike the multinational origins of empirical evaluation of surgical therapy, the introduction of an empirical approach to the evaluation of medical treatments was a largely British initiative and the principal actors were medical graduates of Edinburgh University. One of them was James Lind (1716–94). He was implementing Bacon's concept of 'ordered experience' in his clinical trial. (Tröhler, 2001) From the positivist orientation, the independence of the known 'fact' rests on its correspondence to a reality that any objective observer might know. This assumes both a universal perspective, a 'view from nowhere,' *and* a correspondence theory of reality. (Tauber, 2005) Such a mode of understanding and conceptualization was very much palpable in Indian context. India had to envisage an altogether different ('other') cognitive and philosophical import.

There was descriptive anatomical knowledge in traditional medicine enshrouded by philosophical and religious orthodoxies and interventions which made it 'holy' and

'eternal.' But Western medical knowledge provided the knowledge of dissection and revealing the interiors of the body. The body was subjected to experimental verification. Rasmussen identifies one source in the concession of established Christian orthodoxy to permit dissection of the human body some five centuries ago. (Rasmussen, 1975) Such a concession was in keeping with the Christian view of the body as a weak and imperfect vessel for the transfer of the soul from this world to the next. For in the eyes of the Church these had more to do with religion and the soul and hence properly remained its domain. This compact may be considered largely responsible for the anatomical and structural base upon which scientific Western medicine eventually was to be built. For at the same time, the basic principle of the science of the day, as enunciated by Galileo, Newton, and Descartes, was analytical, meaning that entities to be investigated be resolved into isolable causal chains or units, from which it was assumed that the whole could be understood, both materially and conceptually, by reconstituting the parts. With mind-body dualism firmly established under the imprimatur of the Church, classical science readily fostered the notion of the body as a machine, of disease as the consequence of breakdown of the machine, and of the doctor's task as repair of the machine. Thus, the scientific approach to disease began by focusing in a fractional-analytic way on biological (somatic) processes. (Engel, 1977)

In this paper, there remains a modest attempt to specifically focus on: (1) the shaping of transformatory perceptions about the three-dimensional body against the two-dimensional body-frame in Āyurvedic education, (2) localization of *space* (in the form of anatomical pathology against ayurvedic humoral pathology) and *time* (both in the form of anatomical physiology against humoral physiology and the production of *clinical charts* in hospitalized patients), and (3) creation of medical professional authority outreaching people through teaching institutions, dispensaries, hospitals, cantonments, asylums, and jails and also through private practice. Medicine was one of the ways in which imperialism sought to 'know' the people and establish its authority over them – thorough vast quantities of information about diseases and health that began to be amassed in statistical and scientific form and through development of medical agencies, themselves often branches of the state structure itself, that began to reach out into the countryside as well as towns. (Arnold, 1988: 17) Through 'knowing' the people and establishing its

authority, colonial medicine did create a new kind of subjectivity that was altogether different from that of Āyurvedic viewpoint. "Whereas in the pre-colonial past health and medical care were matters for individual initiative or at most communal effort, under imperial rule they became part of a wider process of state regulation and centralized control." (Arnold, 1988: 18)

In the early years of 'Colonizing the Indian Body', it would cost 100 pounds to train a soldier. Hence, this loss had to be averted. (Moore, 1862: 6) Colonel Hodgson warned, "in Bengal one year encounters as much risk of life as in three such battles in Waterloo." (Moore, 1862: 13) During the first sixty years of the present century the mortality among European soldiers in India averaged 69 per 1,000 annually, while invaliding, during at least the latter part of the period referred to, averaged 29 per 1,000. Surgeon (now Deputy Surgeon-General) Chevers, comparing other death-rates as given by Dr. Guy, found that while European soldiers in India died at the rate of 69 per 1,000, the mortality among the metropolitan police was only 7 per mille. A year passed away, and 125 recruits were required to fill the broken column. Eight years passed away, and not a man of the original thousand remained in that dissolving corps. (Moore, 1886: 1-2) The army and navy and the East India Company required large numbers of medical officers. These services offered situations and advancement for large numbers of young men, and not only during the French wars. The army employed just 142 surgeons in 1793 but over 950 by 1815. Indian situations increased as the Company's domains grew. In 1793 the Bengal presidency directory listed 155 surgeons. By 1837, it included 379. (Stanley, 2003: 24) The mortality of Indian service ensured that each year the Company's directors sought replacements, and the Company's 'Cadet papers' demonstrate there was no shortage of applicants. The cholera epidemics of the 1830s prompted a requirement that all British vessels carrying more than fifty passengers should have a qualified surgeon aboard. 'The cholera has done this good for young surgeons' the *London Medical and Surgical Journal* remarked. (Stanley, 2003: 24) To Regency and early-Victorian Britain, the term 'surgeon' covered a great diversity of character, commitment and competence. It included the operative surgeons in the great metropolitan hospitals and civil medical officers in Indian cantonments, regimental surgeons and men who were becoming known as general practitioners. (Stanley, 2003: 29) In addition, to remember,

"The mortality was so great that the population, the productivity of the land, and consequently the government revenue were greatly diminishes." (Gibson, 1983: 203)

It was mandatory for the British to introduce modern medical education in Bengal (and India). During the nineteenth century Western medicine enjoyed an intimate association with colonial power. "Its first priority was the protection of the European community and those interests and individuals closely connected with it" (Arnold, 1985: 179) At the same time, the existence of established medical systems and folk practice constituted a major barrier to the penetration of Western medicine before 1900. Colonial medical practice in India benefited European medical personnel in two ways – (a) "Our professional brethren in India *have the opportunity of observing* effects of climate on the human system, over an extensive and greatly varied portion of the surface of the earth, on distinct races of man, dissimilar in their food, habits and regimen." (*Edinburgh Medical and Surgical Journal*, 1826: 396), and (b) "Though many medical men obtain very considerable eminence in their character as physician in Calcutta and other presidencies, and no small member turn *their experience* which they have acquired in India, *to good account at home...*" (*Parbury's Oriental Herald and Colonial Intelligencer*, 1838: 251-252)

Here are two relevant issues. First, the seventeenth century saw the birth of three very important things, namely – scientific chemistry, the microscope, and the idea that disease might produce specific changes in the blood which could be detected and would be helpful in the management of the patient. The lesion spoke through the patient, though it only finally yielded its secret in the physical examination. In other words, clinical pathology and pathological anatomy began to make long strides. (Foster, 1959) Second, with the introduction of the use of stethoscope by Laennec in 1816 this science turned out to be that of physical diagnosis, and led directly to the organ-pathology and Linnaean identification of 'disease', the two developments that became major contributions of the nineteenth century to Medicine. (Newman. 1960) Aided and informed by these technological advancements and an altogether different system of knowledge Europeans came to conquer geographical territories as well as knowledge world of India. It was in its validation of the colonial civilizing mission and 'difference' that colonial medicine informed attitudes and responses within indigenous society. It may be emphasized here

that the word *science* is adopted by Āyurvedic doctors (as by many other kinds of doctors) as a sign for a universal knowledge that transcends national and cultural boundaries. For most Āyurvedic doctors today the question seems to be not whether Āyurveda is a science (indeed, the root *veda* is routinely translated as science) but rather how it might differ from other sciences. (Langford, 1995: 334) With this objective, it may be pertinent to know, (a) how, with the introduction of anatomical knowledge in India, a new history of 'medicalization' and surveillance of population was written for ever, and (b) how different levels of interactions are noted and certainly shaped by an encounter with modernity that takes place on various fronts, from the purely medical to the socio-moral.

At this juncture, we can cite two differing accounts (more than two centuries later than that of Fryer) of a Bengali peasant and of elite. These accounts reveal multi-layered perception of the body, being and conceptual framework in colonial India. A peasant of Birbhum (of Bengal) writes to a person (to whom he owed some amount of money), "I went to town wreaking evils against you, so I am contacted with an alien disease. You should know it ... and on getting cured I must repay the whole of debt whatever I owe to you." (Mandal, 1953) On account of the complex referentiality of somaticity in India, the body provides a kind of skeletal structure for an alternative history of disease understanding and the specific site for identity formation (particularly during nationalist period) against colonial backdrop.(Alter, 2000) An opposite contemporaneous 'elite' account is provided by Dwijendranath Tagore, "Treatment by any means is a wild goose chase! So better not to say anything about *kaviraji chikitsa* (Āyurvedic treatment) – even the shimmering rays of nineteenth century knowledge has failed to penetrate its windows." He continues, "Modern medicine starts with *dissecting* a cadaver. Āyurveda starts with elaborating on relationship between the body and mind." Inspired by "modernity" he uses innovatively the categories of Āyurveda like *vayu, pitta, shlesma* (wind, bile, and phlegm), to interpret the superiority of Western intellect. In his opinion, persons like Danton belong to the category of *pitta* or bile and represent "social dynamics." Finally, he concludes, "By the raging light and scorching heat of English education orthodoxies began increasingly to be banished from metropolis to the fringe of villages." (Tagore, 1891) It is understandable that while in the first account the role of

karma comes first for disease causation[1], in the second, *dissection* (or anatomical spatial localization of organs) constitutes the core of argument. Another interesting point may be noted. Technical terms (*pitta, shlesma* etc.) used in Āyurveda were extensively used in every-day life too with different connotations. "The primitive meaning which can be restored does not indicate quite surely the derivative meanings in which the words have been used in the texts." (Filliozat, 1964: 144)

Importantly, the vision of the sick-man institutionalized within the tenets of Bedside medicine was that of conscious human totality – a viewpoint that transcended, not merely united, the distinctions of psyche and soma found in modern medicine. (Jewson, 1976) Put against Rasmussen's analysis some interesting facts can be elucidated here. On 24 March 1603, after nearly half a century on the throne, the mortal form of Elizabeth I ambiguously returned to being solely a body natural. Her remains were attended as assiduously as she had been in life. "No longer sovereign, she reverts to being a woman whose wishes can be ignored. Her body natural is unimportant in the transfer of power to the next monarch, it is the effigy that counts." (Cregan, 2007) Again, "This unwarranted breaching of her body was performed by a fledgling group of 'scientists' whose work enjoyed the royal imprimatur." (Cregan, 2007: 51) Anatomical dissection was not conceived of as an extension of retributive justice in England until the 18th century, nor was that conception put into law until the 'Murder Act'. Fate of the felons was more tragic. They were carried back to the Hall under a pall kept for the purpose, for ceremony's and modesty's sake. Once at the Hall they were placed on a table, still beneath the pall and at one stage behind a screening curtain, to wait in readiness for the lectures. At this period all public anatomies were held in the main Hall, with the table centrally located, surrounded by scaffold seating that was set up specifically for the occasion by a carpenter. When the Reader, Masters, Apprentices, Stewards, etc. had assembled, the body would be uncovered. Six anatomical lectures were given over three days, with a morning and afternoon lecture on each day. Each day was spent on a separate system, and in a strict order that took into account the natural processes the body was undergoing in an age when neither embalming nor cool storage were effective:

[1] Kutumbiah understands *karma* as "movement". It is "action" for Wujastyk and Debiprasad Chattopadhyaya, while Julius Jolly understands it as a question of rebirth.

visceral, muscular, and osteological. (Cregan, 2007: 53-54) It was that period when social milieu was reconstituted with heavily charged philosophy of positivism and utilitarianism. (Forbes, 1999; Stokes, 1959) To my opinion, whatever brief or sketchy it may be, it is useful to understand the development of anatomical knowledge, medical education and hospital system in England to have a better understanding of the role of anatomical knowledge in colonial medical education. I shall discuss this issue in some greater details later in my paper.

II Characteristics of Western Medicine till the Beginning of the 19th Century

Western medicine has passed through epistemological and paradigmatic shifts as discussed above. But till the end of the 18th century or the beginning of the 19th century, it, in its theoretical content, was essentially guided by ancient humoral theory, which was not seemingly much different in its core from Indian medicine. But how was Western medicine both *epistemologically* and *ontologically* before the fully evolved structure as we experience now? Even legendary physicians like Boerhaave (1668-1738) or Sydenham (1624-1689) stressed on taking patient's history as the most important thing to learn. There is a very remarkable passage in Sydenham's *Treatise of the Dropsy* going through which one will find that "he asserts not only his own strong conviction of the importance of a knowledge of minute anatomy to the practitioner, but also his opinion that what Hippocrates meant, was to caution against depending too much on, and expecting too much help from anatomical researches..." (Brown, 1866: 83-84) In Sydenham's own words, "in all diseases, acute and chronic, it must be owned there is an inscrutable (i.e. Greek word), a specific property which eludes the keenest anatomy." (Brown, 1866: 84) Herman Boerhaave, another great 17th -18th century physician, taught his students, "Everything pertaining to the case must be listed... Narration must be done carefully so that the order of events be unchanged; there must be arrangement according to the surging change of events, and each event must be recorded in its proper place." (Derbes and Mitchell, 1955) We find both the medical stalwarts, Sydenham and Boerhaave, were more interested in patient's history than on pathological findings.

Moreover, the medical world of the early nineteenth century was, in the words of a contemporary, 'mixed, jumbled, brayded and blended'. "Compared with Paris London

boasted more than twice as many qualified medical men per head, all rivals in an open and fiercely competitive market. In addition to the 'regular' practitioners were 'the irregular troops of corn-doctors, horse-doctors, tooth-doctors and quack-doctors'." (Stanley, 2003: 23) From the 1790s, hospitals became finishing schools for medical apprentices. Aspiring doctors acquired both knowledge and skills by studying in one of the medical schools of the capitals in London, Edinburgh or Dublin, at Glasgow or the ten English provincial schools established between 1824 and 1834. In 1786 130 students were studying in Edinburgh. By 1806 the number had risen to 366 and in 1826 to 574. London hosted 800 students in the 1820s and by the 1840s perhaps 1,500 enrolled in the capital's hospitals and private schools at any time. (Stanley, 2003: 161) In the eighteenth century, there were very few essential educational prerequisites to medical practice. Medical students could devise and select their own curriculum, according to what their financial resources would allow and what form of medical career they wished subsequently to pursue. "The market for medical services in the eighteenth century being an open and pluralistic one, the successful practitioner was by necessity an entrepreneur... London was good place to which to come to learn anatomy." (Wrigley and Revill, 2000: 90, 92) Hospital appointments were almost entirely honorary. Guy's paid its surgeons and physicians £40 a year. On the contrary, private medical and surgical business was quite lucrative. "The rewards of success could be considerable. The surviving receipt books of Benjamin Brodie, for example, show that he made over £8,000 a year in the late 1820s while Sir Astley Cooper, the surgeon to the King and popular among his colleagues, was believed at the time to have made over £15,000 a year from private practice." (Stanley, 2003: 25)

Sir Cooper strongly advocated for (1) the requirement for surgeons to improve their knowledge of anatomy, and (2) the need for the medical profession to close ranks against the activities of unqualified practitioners. Doubtless it led to the stream of professionalization of medicine. Sir Astley's emphasis on the importance of anatomical knowledge was actively supported by no other than Wakley, the famous editor of the *Lancet*, who wrote in the February 8 issue of 1924 – "Without anatomy medicine and surgery cannot be acquired; and by these sciences, some of the greatest evils which afflict human life can alone be relieved." (Kandela, 1998)

By the late eighteenth century, London had become not only a center for surgery, anatomy, firsthand dissection, and hospital experience, but also a training ground in medicine, chemistry and midwifery. "The evidence suggests that many London students pursued an education suitable for general practice without regard to the ostensible professional divisions embodied in the traditional London medical corporations." (Lawrence, 1988: 172)

But, unlike India, there were some indelible changes – (1) rise of institutional medical education and practice, particularly hospital setting, (2) mandatory acquisition of anatomical knowledge through cadaver dissection, (3) rise of medical professional authority, (4) hierarchical division between physicians, surgeons and apothecaries, (5) study of post-enlightenment scientific logic and reasoning to produce both "capable enquirers" and "capable practitioners" in a pluralistic, free market of industrial society, (6) mapping of the body from a mechanistic viewpoint plotted against three-dimensional anatomical space, or the volume of the body, and linear, scientific, clock-time consistent with physiological swings, and, finally, (7) an altogether different paradigm of patient-physician relationship – patient-physician-service – against the background of clinical detachment. Anatomical and tissue pathology played a central role in this transformation. (Dyer and Thorndike, 2000) The singular act of post-mortem dissection and its marvelous use in organ localization of disease and successful surgical procedures differentiated Hospital medicine from Bedside medicine as well as established its unquestionable authority over Indian medical knowledge system. Pathological anatomy was only rarely applied to bedside medicine, since it was impossible to detect the organic changes in a cadaver before the patient died. Specific organic lesions had been described for at least a century, but, for several reasons, practicing physicians were unfamiliar with anatomical changes. "With auscultation, it became possible to detect internal changes in the living patient." (Duffin, 1999: 252) However, Laennec's 'doctrine' stated that the body has three components: solid (organs), liquids, and vital principle. Each can be altered to produce disease. Lesions are of two types – solid lesion and liquid lesion. Here again, though Laennec talks about pathological anatomy the notion of *vital principle* is retained. (Duffin, 1999: 263) When British came to India, all these sea changes were occurring within their world of medical knowledge. There was a mutual refraction of colonial and

metropolitan medical theory. British people's conceptions of their own biomedical identity were reformulated within a global context, as part of their own response to the experience of colonial disease. Moreover, "The British experience of disease raised questions about where colonial contact begins and ends as the imperial metropole with its heterogeneous, impoverished, and anonymous populations seemed more and more to be simulacrum of the periphery." (Bewell, 1999: 12-13)

Two issues are intertwined here: (a) the evolution of Western (in our case British) medicine from its old quarters of humoral theory to the stage of Hospital Medicine, and (b) various phases of contact, interaction, assimilation and encounter between this system and traditional Indian healing systems (in our case Āyurveda). "The practice of medicine in early modern England was dominated by the humoral theory, originating in ancient Greece." (Lane, 2001: 2)

We may now proceed to elucidate the points raised in this section. Charles Newman argues, "To make a very broad generalization, the practice of medicine since the Renaissance has fallen into three phases. In the first, diagnosis was made by the elucidation of symptoms, and treatment was based on *a priori* theory (applied with heroic vigour). This phase lasted from the end of the fifteenth century to the beginning of the nineteenth century. In the second phase, diagnosis was based on physical examination of the patient, and treatment was aimed at structural abnormalities; this lasted for the rest of the nineteenth century, and has been succeeded by the third phase, which is still being developed, in which diagnosis is based largely on laboratory..." (Newman, 1958) During this process, medicine and normativity appeared to be fundamentally linked. "To conjure up the image of the doctor is simultaneously to visualize the sickbed on which the ill body is *isolated*, the case notes that individualize the progress of the condition in relation to medical *norms*, the charts and records..." (Rose, 1999: 53) We should take note of 'isolated' or 'individual' patient and his relation to 'norms'. It should also be emphasized that prior to the development of such rather regimented and surveillance-oriented (bio)medicine it had to pass through stages of fluidity, non-uniformity of medical education – sometimes bordering on seemingly directionless-ness. It was most poignantly marked during the 17th and 18th centuries, often extending onto the 19th century. Organ localization of disease was not the call of the day even during the late 18th century, at

least in Britain. For example, physiology at Bichat's time did not yet exclude the observation of social factors and influences. "He regards the superiority of the right side as a social convention." (Ackerknecht, 1967: 54) However, he raised question, "What is the value of observation if one does not know the seat of the disease?" (Ackerknecht, 1967: 56) More than 150 years after the discovery of circulation in 1616 by William Harvey in 1759, Richard Davies, a Cambridge scientist, wrote to Stephen Hale "the discovery of the circulation has not been followed by so great advancement in the science of medicine as was naturally to be expected from it. The reason of which is, that our theory has not yet advanced much in the knowledge which is naturally founded upon this grand principle." (Robb-Smith, 1962: 6) Moreover, the 18th. and the 19th-century therapeutics were heavily charged with old knowledge of treatment based on humoral theory. Disease was due to a localized irritation of some viscous and should be treated by a powerful anti-phlogistic or weakening regime, which consisted of starvation and bloodletting. This arbitrary doctrine was replaced gradually by "the statistical arguments of Louis, the sarcasms of Laennec" (Robb-Smith, 1962: 15), and, to add Hunter's contribution to anatomical pathology. (Lakhani, 1991) It is found that a 17th century physician of no less stature than Sydenham suggested that attempts to discover the causes of disease were doomed to fail. Another example may be had from Sir Richard Blackmore, a pupil of Sydenham's. He was advised by Sydenham to read *Don Quixote* if he wished to become a good doctor. This is a fact "which does not exactly betoken great confidence in the achievements of medicine as they then were." (Fischer-Homberger, 1970)

There were some problems with the status of a surgeon too. "To Regency and early-Victorian Britain, the term 'surgeon' covered a great diversity of character, commitment and competence. It included the operative surgeons in the great metropolitan hospitals and civil medical officers in Indian cantonments, regimental surgeons and men who were also becoming known as general practitioners." (Stanley, 2003: 29) It included men who practiced dissection daily, who rehearsed operations on 'the dead subject' and who operated once a week or more and also those who drew no more blood than that spilt using a lancet and avoided operating at all costs. It encompassed men who practiced at the highest level of professional knowledge and those barely removed from quacks.

Despite the names 'surgeon' or 'surgeon apothecary' the great majority of men graduating from these various institutions were destined to practice medicine in general rather than surgery in particular. Men nominally 'surgeons' could practice for years without cutting more than a boil or a vein. In addition, "Baglivi, Belini, Bernouli, Michelotti, and Boerhaave hit on a number of discoveries by applying the principle of mathematics to medicine, and the anatomists uncovered many of nature's secrets, however, all these findings were of no practical use." (Fischer-Homberger, 1970: 399) To be brief, nosology was of primary interest to the leading physicians and medical scientists belonging to the world of those centuries. Delving into the depth and volume of the bodies was not much alluring to them. Bichat's "Open up a few corpses" was not a cup of tea. This scenario can be substantiated by a tragic fact. Though Laennec's discovery of stethoscope and mediate auscultation verified by post-mortem studies were published in 1819, the reputed attending physician of the poet John Keats Dr Clarke did not apply this method to the diagnosis of Keats's pulmonary tuberculosis (or phthisis) complicated by copious haemoptysis. In her famous biography of Keats the author ruefully comments, "Everything that ignorance could blunder into, every mistake of practice which could be made were done and made with the best possible intentions by Dr. Clark. He meant well, but the tale is heart-rending. A perfectly just summing up of him is, I think, that he was a poor doctor, with a kindly heart and a pleasant *bedside manner*." (Jarcho, 1961. Emphasis added.) Despite this, "The image of the physician as a demi-god possessed of boundless authority over patients dates from the late nineteenth century. Female patients, for example, became willing to submit to pelvic examinations and to give birth in the lithotomy position because they had acquired an implicit belief in the doctor as scientist." (Shorter, 1993: 790)

Jewson states the characteristics of this period under consideration in a more explicit way, "In the period under consideration medicine was regarded as an area of intellectual enquiry in its own right. The 17th century scientific revolution had little impact on the fundamental characteristics of theory and therapy... The very definition of illness was couched in terms of the patient's complaint, rather than internal lesions or cellular malfunctions... Medical consisted of a *chaotic diversity* of schools and thoughts, each strenuously seeking to attain ascendancy over the others." (Jewson, 1974: 370-371)

More importantly, "despite criticism of specific aspects of the ancient texts and the appeal to new sources of legitimation, the classical authors remained the standard works read by medical students at the English universities." (Jewson, 1974: 372) Only new addition to this system of knowledge was the crude accommodation of Newtonianism. Interestingly enough, we shall find almost similar phenomenon in Indian context too. The eighteenth century saw a bewildering proliferation of medical texts and theories that seems indeed to have been a distinctive feature. Intense as the debates between medical theorists were, it did not make much practical difference to the understanding of disease at the bedside whether the morbid matter was conceived of as particulate or humoral. Many theorists combined both forms of explanation. (Nicolson, 1988) It can be easily conceptualized while comparing the eighteenth-century term "metastasis" with its present day connotation – "As well as being expelled to the outside, morbid material could be transferred from site to site within the body, thus altering the locus of disease. This was what eighteenth-century writers referred to as metastasis...To the eighteenth-century physician, restitution of health was a temporal process, modulated by the changing conditions of the internal organs-changes which only he had sufficient skill to discern." (Nicolson, 1988: 281, 292) It will be more revealing when we compare the two systems of education sans private fee, prominent institutional role and more secular nature of the British education. One example can be cited here. As late as 1777, in surgical lectures of Munro Primus, we find the elaboration of the teaching material in this way –

Medicine is commonly divided into five parts:

Ist or an extract Knowledge of ye humane Bodys.

2d or history of Diseases.

3d or Signs of Disseases.

4th or Means of preserving Health.

These must be understood and acquainted with before we can pretend to venture on the 5th or ye Method of Curing and healing Disseases which is performed by ordering a right Diet; by Pharmacy or prescription of Medicines; and by Surgery or Manuall Operations: this last is ye province that falls to my Share, which would appear to be of as long Standing if not more Antient then any part of Medecine for wee see by ye Antidiluvian History that very soon after the

Creation Fends, Animosities & Envies possessed the hearts of Men hence Rapines Murders and petty Wars Ensued by which the Parties might have been expos'd to externall Injuries, for which Nature prompts people to seek and apply a Remedy, that is Surgery tho' perhaps very unperfect must then have been in Exercise whilst otherwise the Inhabitants of ye Earth lived so temperately in such a moderate Climate and Serene Air that they arrived to these prodigious Ages of which ye Scripture gives an Account. Some of them lived to [blank] Without being obnoxious to those Disseases which this Day so effect Mankind. (Wright-St. Clair, 1961)

It is interesting to note that Āyurveda is often called *Aṣṭānga Āyurveda* because it has eight branches or divisions. These facts will be dealt with in the later part of this essay. In the above-mentioned lecture Munro Primus talks about the qualities of a new surgeon:

I shall think it necessary for Surgeons to be acquainted with them (i.e. Internal Medicine) in several Cases.

This particular Science is divided into four branches.

1st *Synthesis* or Joining or reuniting parts yt are contrary to ye Design of Nature seperated, as in Curing of Wounds, reducing Luxations, Setting of fractures.

2d *Diaresis* Dividing or seperating those parts yt by their Union are hurtfull as in perforating ye Anus or Vulva of Children, seperating of Members grown together after burning.

3d *Exe resis* Or taking away what is Superfluous or Noxious as in Amputating a Sphacelated Member, Extracting Bullets lodged within ye Body, Letting out extravasated blood, Matter or Pus.

4th *Prosthesis*; or making up any Want or Supplying a defect; as fitting wooden Leggs to Stumps, setting in Artificial Eyes or Teeth.

He goes on – "A regular Surgeon thus qualified who would practise right Ought before he goes about the Cure to be thoroughly acquainted with ye History of the Dissease, in which he is to have regard to the Patients Sex, to his Age, to his Constitution and former way of living; and Inform himself how ye Dissease encreased, if there was any known Cause for it, then to Consider ye Nature of it, and place it is in, and ye effects

it has produced, which knowledge is called ye Diagnosis whence ye Prognosis or what ye Consequence will be must be drawn and then see what Method of Cure is pointed out which is termed ye Indication. . ." (Wright-St. Clair, 1961: 289)

When one reads this passage it sounds very similar with a part of *Suśruta Samhitā* – "Young persons, who wish to take up the noble profession of healing the sick, should be of good social status, physically robust and healthy, mentally energetic, eager to learn, patient and painstaking, pleasant in speech and manners... The subject of study should not be limited to Āyurveda alone, but should include as much as possible all other branches of science and philosophy... Before commencing actual practice, the intending physician has to obtain a proper licence or permission from the royal court... He should remember that patients trust their physicians implicitly to the extent of placing their lives unhesitatingly under their care." (Ray, Gupta and Roy, 1993: 107)

Coming back to the period of Bedside medicine, one of the important characteristics of the 18th century medical education can be traced thus, "The emphasis on constructing a theory of surgical diseases, especially on creating new physiologies to account for morbid changes, such as inflammation, well known in John Hunter's work, made surgery respectable by giving it an abstract foundation. In the process, the senses could not be given the free rein associated with empiricism, but had to be disciplined and ordered by a rational system." (Lawrence, 1993: 163) Moreover, "Competing theoretical systems, attention to the patient's account and the lack of physical examination... for the practitioner - in theory - had little social or intellectual authority to violate the patient's physical privacy and much to gain by providing acceptable explanations of illness and therapeutic regimens... surgeons, in contrast, were much more closely tied to the 'objective' experience obviously offered by a deep knowledge of anatomy and the need to touch their patients to identify conditions and to operate. For surgeons, what the patient said would supposedly be of less importance than what the practitioner saw or felt." (Lawrence, 1993: 155-156) In this social milieu, medical practitioners did not comprise a homogeneous occupational group but were divided into several, often warring, factions. The costs for a physician's training were high. Professional education at Oxford and Cambridge consisted of a six years' course in a wide range of subjects, followed by a slightly longer period of devoted to a literary study of the classical medical authors. The

surgeon and apothecary had a lower status and income than the physician. (Jewson, 1974: 374)

The eighteenth century physician was expected to be, above all else, a gentleman, socially accepted in the circles among which his patrons moved. Elegance and wit were of greater importance than technical competence. Waddington comments, "It is clear that such a situation was inimical to basic research and innovation in medicine." (Waddington, 1973) Moreover, "Perhaps one of the most *important* methodological changes characteristic of early nineteenth century medicine was the shift from *observation* to *examination*." (Waddington, 1973: 214) The Victorian era was an age of imperialistic expansion for Great Britain. Not a single year passed between 1837 and 1901 without British troops and traders being engaged in combat somewhere. "The influence of exotic climates on British clinical science was to continue in the nineteenth century when Manson, a graduate of Aberdeen University, working in China and also interested in sprue, showed that filariasis was transmitted by a mosquito, an observation greeted with incredulity when published in the *Transactions of the Linnaean Society* in 1879, and in 1897 Ronald Ross discovered the malarial parasite in the stomach of an anopheles mosquito." (Booth, 1979: 1472)

Until the nineteenth century, the training of practitioners in hospitals varied greatly from one institution to another and was essentially controlled by the senior men in the hospital as to syllabus, length of courses, fees and practical experience. "The provision of medical attention since the early modern period in England had always been a business, with fees paid for services rendered. However, in the consumerist eighteenth century, medicine expanded fastest of all the superior occupations to become...Medicine became with larger apprenticeship premiums, better incomes and higher social status for practitioners, an occupation which gentry or ambitious parents could choose as a career for their sons." (Lane, 2001: 11) Despite these characteristics (and lacunae with regard to present day medicine), an important step in the professionalization of medicine was the publication of medical registers from 1779, enabling patients to choose practitioners and to contact each other. In 1783 there were 3120 practitioners. Of these 363 were physicians (11.6%), 2614 were surgeon apothecaries (83.6%), with 79 apothecaries (2.5%) and 64 surgeons (2.05%). (Lane, 2001: 15) Until the nineteenth century, the

training of practitioners in hospitals in England varied greatly from one institution to another. The term 'practical anatomy', clearly implying dissection, was not noted as a feature of anatomy courses in the London hospitals until 1802. It was also noted by a foreign visitor in 1791, "The aversion of the English to anatomical dissection is another of the prejudice which characterize that nation." (Lane, 2001: 26) There would remain little wonder that the British, with this experience in their homeland, must be cautious, yet avid to introduce anatomical dissection in India as early as they could do.

Following our discussion so far we can take note of some important facts –

(1) Till the beginning of the nineteenth century medicine or Bedside medicine was principally guided by the humoral theory of ancient Greek origin. Gaining anatomical knowledge through dissection was running parallel to it and, as a positive impact, fortified this endeavor. "For the first time students were exhorted to understand the structure and function of the body by detailed dissection. Dissection of cadavers became a mania. In 1801 Hampton Weekes, a student, told his father (an apothecary) that St Thomas's apothecary had given him a foetus ('very perfectly formed about 4 Inches long'). Anatomy to these men meant 'surgical anatomy': the knowledge they needed in order to operate. Many surgical students became demonstrators in anatomy in hospitals or private medical schools before becoming operating surgeons, and medical journals and medical societies ceaselessly disseminated and published the results of the anatomical spirit animating the profession." (Stanley, 2003: 50-51)

(2) There was a chaotic educational environment with respect to the training of a physician or a surgeon.

(3) Along with this there was development of scientific inquiries and newer practical innovations like Hunter's successful surgical treatment for popliteal aneurysm. "He closed the loop of the scientific method: hypothesis, experiment, clinical application and evaluation of results. This was translational research in another era." (Moore, 2005) A late-seventeenth century physician Archibald Pitcraine succinctly puts it, "I do advise indeed all diligently to consider the Principles of the Cartesian Philosophy, and to compare them with those of *Democritus*, so far as Geometry will conduct them... as Quantification for the Study of medicine, I rather recommend an Acquaintance with the *Mathematicks*, than with the *Philosophy* which so much *now in esteem.*" (Guerrini, 1987)

(4) "By the late eighteenth century, London had become not only a center for surgery, anatomy, firsthand dissection, and hospital experience, but also a training ground in medicine, chemistry, and midwifery. The evidence suggests that many London students pursued an education suitable for general practice without regard to the ostensible professional divisions embodied in the traditional London medical corporations." (Lawrence, 1988) Between 1780 and 1820, students primarily sought training on the surgical wards of a large London hospital. The hospital ward-walking pupils formed a ready audience for lecture courses that supplemented their experience and personal study. The number of courses advertised in the basic subjects between 1775 and 1820 were: anatomy (frequently entitled "anatomy and physiology" or "anatomy, physiology, and surgery"), practical anatomy (dissections with demonstrations), surgery, chemistry, materia medica, the principles and practice of medicine, and midwifery, often including the diseases of women and children. In addition, instructors offered courses in a variety of supplementary subjects, such as botany, experimental philosophy, physiology, diseases of the eyes or teeth, and clinical lectures. By the middle of the nineteenth century the basics microanatomy of the body was accurately known.

(5) Gradually, but relentlessly, Bedside medicine gave way to Hospital medicine. (McVaugh, 1997; Vandenbroucke, 1998) The eighteenth century was undoubtedly the most remarkable period of hospital building in England, with twenty-nine new infirmaries erected in the provinces in the years 1736-1797, five London (1720-1745) and a further five in Scotland (1729-98). (Lane, 2001: 82) In 1827 John Abernethy observed, "Unquestionably hospitals are the best schools of medical instruction for in them we have the patient's conduct under control, and can regulate and closely trace the progress of disease... the practical knowledge of our profession is much more readily obtained in hospitals than it can be anywhere else." (Abernethy, 1827)

It should also be kept in mind that even when practical anatomy or dissection was not in vogue in Europe it was supplemented by anatomical drawings and atlases. In Paris, Modeville was using his *Anatomy* as the introductory part of a projected five-book *Surgery*. In the Book I on *Anatomy*, he writes (1304 A.D.), "The first of 13 figures by which alone the entire anatomy and inquiry into the human body can be demonstrated clearly... whole and dissected, from front and rear... internally and externally, separately

and integrally, in every way in which it is possible to be shown to human view." (MacKinney, 1962) The body, as easily understandable, was made inside out – the image of the body becomes perceptibly three-dimensional. Such a phenomenon was unthinkable in Indian context.

Another stalwart of medical revolution Laennec stressed on three points – (1) to identify a pathological condition in the cadaver through physical change in the organs; (2) to recognize the same condition in the living, if possible, through physical signs independent of symptoms, that is accompanying various disturbances of vital action; (3) to treat the disease with those remedies which experience has found to be most efficacious. (Ackernecht, 1967: 93) The basic question was succinctly addressed – the body was made inside out, not the body or 'body frame' as such.

Anatomical and tissue pathology played a central role in the transformation of Western medicine that began in the last decades of the eighteenth century. "The Hunterian school restructured the Morgagnian relationship between pathological anatomy and physiology by emphasizing knowledge of the dysfunction producing the lesion, as much as the lesion itself, and its disruptive effects on physiological equilibrium." (Keel, 1999) Ruth Richardson, in her seminal work, comments, "The hospital seems to have extended the offer of preferential hospital admission to the sick poor of parishes agreeing to grant the hospital exclusive use of parish dead." (Richardson, 2000: 242) Thus, we can deduce that the spread and mandatory acquisition of anatomical knowledge is intimately tied up with the rise and extension of hospital systems as the main vehicle of medical and clinical learning. In tandem with this development there occurred a sea change in the perception of the sick-man. "The vision of the sick-man institutionalized within the tenets of Bedside Medicine was that of conscious human totality – a viewpoint that transcended, not merely united, the distinction of psyche and soma found in modern medicine." (Jewson, 1976) Jewson also notes that, "The raw materials of medical theorizing now became the innumerable morbid events, occurring within the gross anatomical structures, which presented themselves to the clinical gaze on the crowded wards... The sick-man became a collection of synchronized organs, each with a specialized function." (Jewson, 1976: 229)

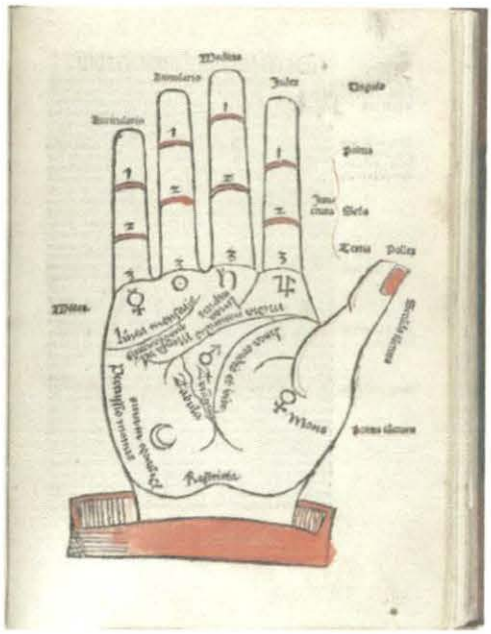
In an article of 1867, revealing new attitudes to scientific education, the *Lancet* contrasted methods of instruction based upon 'questions arising out of the cause of disease' with those relating to methods of cure. The English system placed the emphasis on the second approach. Students were called upon to 'act' before they 'had been taught to know'. More attention was required to the laws of physical science, anatomy and chemistry, structure and function. Students should understand scientific principles; unfortunately 'young men often aimed at being practical and were contemptuous of a more basic approach', adopting the attitudes of some of their seniors. The *Lancet* epitomized the aim of continental education as the production of a 'capable inquirer', while the English system produced 'a capable practitioner'. Neither alone was sufficient. (*Lancet*, 1867) Early nineteenth-century medical training was extremely diverse. While some practitioners held university degrees from the most respected medical colleges of the world, some were apprenticed to apothecaries where they "spent most of their time capping bottles and rolling pills." (Youngson, 1979: 12) Still others were quacks and drug peddlers who practiced freely with no legal sanctions against them. These kinds of practices were to change with the passing of the Medical Act Amendment Act of 1886. Gone were the antics such as "Steeplechases in the dissecting room, cheating on the Latin examination, flirting with the barmaid, gin-and water until three o'clock in the morning." By the 1880's, these stereotypical university scenes were replaced by "a new image of the medical student: surrounded by books, a model of human skull at his elbow, he labored over his studies with gravity and decorum late in to the night." (Peterson, 1978: 40) Increasingly, the hospitals were conceived, not just as a way of mediating the politics of obligation, but also as a way of imposing a strict and salutary moral discipline on the inmates. "Medical practice in 1870, we argue, was structured chiefly around individualized competition for patients at the lower end of the profession, and around a close-knit network of elite patronage at the upper end." (Sturdy and Cooter, 1998) With all these characteristics, the British medicine arrived in India. In Indian context a new era of medicine began to emerge.

This era was also replete with wars – both short and long terms. It did rewrite the history of medicine and Indian subjectivity forever. I shall now proceed to the depth of the matter. But, before that, I shall try to explain the question of anatomical knowledge,

health and disease perception in Āyurveda. In this paper I hope to specifically focus on: (I) the shaping of transformatory perceptions about the three-dimensional body vis-à-vis the two-dimensional body-frame in Āyurvedic education, (II) localization of *space* (in the form of anatomical pathology as poised against Āyurvedic humoral pathology) and *time* (in the form of both anatomical physiology against humoral physiology and the production of clinical *charts* in hospitalized patients), and (III) creation of medical professional authority outreaching people through teaching institutions, dispensaries, hospitals, cantonments, asylums, and jails and also through private practice.

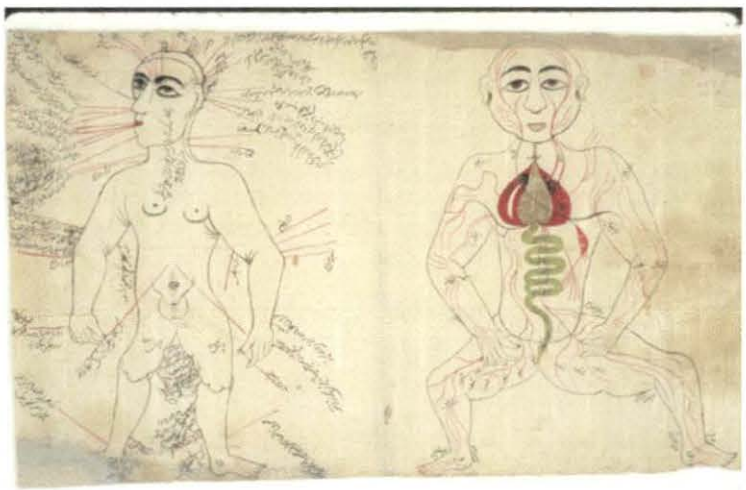
Now let us have a look at the Gray's Anatomy – 1st edition of 1858 – as an exemplary modern anatomical treatise. The book Gray and Carter (illustrator of that historical production) created was simply organized and well designed. The beauty of Carter's illustrations resides in their diagrammatic clarity, quite atypical for their time. Again, in the tradition of Enlightenment anatomy, the passive voice revels on the page, erasing any agent whose presence (whose body) might corrupt the objective aim of scientific description. The description itself is so detailed and precise that language becomes euphemistic; the human quality of the body is stripped away so that Gray may write, "To demonstrate the various fibres of the tongue, the organ should be subjected to prolonged boiling..." and a reader doesn't flinch, doesn't picture a glass specimen jar on a hotplate in which a tongue slowly rises and revolves on bubbles of boiling water. Gray's rhetoric is representative of the scientific worldview that sees the body's functions as derived from the body's structure. So, one's voice, for example, is simply due to an arrangement of muscular fibers in the tongue and the action of muscles in the larynx. Gray ignores what else the tongue may do – a lick, a kiss – and further ignores how the voice may be used or silenced. (Schuette–Hoffman, 2006: 70) Simply put, the *person* of the patient becomes divorced from his/her personhood. It becomes objectified and objectifiable, reducible to any number of anatomical organs. Extended further along this line of argument it has been aptly termed as "A reductionist and contagionist turn in medical knowledge and practice." (Worboys, 2007: 34)

Some interesting drawings of human anatomy across ages can be reproduced here. How perception of the body differed between Eastern and Western conceptualization should be clear from these illustrations.



[**Fig. 14** Hundt, Magnus. *Antropologium de hominis dignitate, natura et proprietatibus, de elementis, partibus et membris humani corporis*. (Leipzig: Wolfgang Stöckel, 1501). We must note accurate surface anatomical representation of the hand even in 1501.

Courtesy: National Library of Medicine – *Historical Anatomies on the Web*.]



[**Fig. 15** Anonymous *Persian Anatomical Illustrations*. [Iran or Pakistan, ca. 1680-1750. This figure is representative of Eastern anatomical drawings bereft of accurate dimensions of the organs.

Courtesy: National Library of Medicine – *Historical Anatomies on the Web*]

III Introduction of Medical Knowledge in Colonial India

In his famous letter of December 11 1823 Ram Mohan Roy, one of the pioneers of Indian 'Renaissance', wrote to Lord Amherst, "this sum (i.e. fund allocated for Sanskrit education in Bengal) should be laid out in employing European Gentlemen of talents and education to instruct the natives of India in Mathematics, Natural Philosophy, Chemistry *Anatomy* and other useful sciences..." (Roy, 1973: 834) This letter perhaps sets the tune of the Bengali elite's attitude towards Western education in India. Moreover, in 1822 Ram Mohan Roy sent a selection of 12 'Hindoo crania' to be examined by Dr. George Paterson. (Paterson, 1824) [On this occasion, Ram Mohan wrote a letter to Dr. Patterson –

Dear Sir,- I regret that I should have forgotten the commission with which you honoured me, some time ago, and feel ashamed of myself for such omission. I now have the pleasure of sending you ten accompanying skulls; and if you find them calculated to answer purpose, I will, with equal pleasure, send you as many as you may think sufficient for your present researches. If you wish me to procure you skulls of different descriptions, you will have the goodness to particularize them, that I seek an opportunity of meeting your wishes.

"Owing to a variety of engagements, I have not hitherto been able to fulfill my intention to pay you a visit, an honour which, I hope, I shall be able to do myself, without much delay. In the mean time, I have the honour to remain, dear Sir, yours most obediently, Ram Mohan Roy. 10th March 1822. (*Transactions of the Phrenological Society*, 1824)]

It is interesting to note, "Rammohan Roy's skull was also studied by the Edinburgh phrenologists after his death in Bristol in 1833 and was found to show "dignity of character."" (Veer, 2001: 146)

Another example may be had from Christian missionary Alexander Duff's endeavor to spread English education in India. "Previously, Hindus, believing their scriptures forbade the touching of a dead body, had always learnt anatomy from models and would not practice dissection. A deputation of teachers from an earlier established medical school and a committee of enquiry appointed by the Government visited Duff's college and asked the students their opinions. They replied that the English education

they were receiving had freed their minds from prejudice and the dissection of the human bodies was not objectionable to them. This attitude towards dissection had profound significance." (Emmot, 1965) An interesting episode can be cited here. Once, this very Committee came to visit Alexander Duff's school. They asked the students of Duff's school "Have you not also *medical Shasters*, which profess to teach everything connected with healing art?" "Oh yes," they said, "but these are in the keeping of Bhoido or physician caste; none of us belong to that caste, so that we do not know much about them." "Do your doctors learn or practise what we call *anatomy*...?" "We have heard them say that anatomy is taught in the Shasters, but it cannot be like *your anatomy*." They asserted that as touching of dead body is forbidden by imperative rules "so that from examination of the dead body our doctors can learn nothing about the real structure of the human body." They also confirmed "but we look upon this as nonsense." The committee then asked, "Would you actually be prepared *to touch a dead body for the study of anatomy*?" The head youth of the class replied, "Most certainly." As a result of this inspection "The commissioners were highly gratified. The result of their inquiry exceeded their most sanguine expectation." (Smith, 1879: 214-218) This inspection makes open a trajectory through medical knowledge in India, at least amongst the elite, journeyed from 'Shaster' to science. The aim of the medical curriculum was avowedly "not intended merely to supply the wants of the State but of the people, and to become a moral engine of great utility." (Smith, 1879: 217)

Consequently, an insidious change occurred within the texts of Āyurveda, "The primitive meaning which can be restored does not indicate quite surely the derivative meanings in which the words have been used in the texts." (Filliozat, 1964: 144) Rahul Peter Das addresses the same problem of interpretation, "'Āyurveda' today often refers to a modern syncretic system in many ways very different from the Āyurveda of pre-colonial times, heterogeneous as this may have been." (Das, 2003b: 30) By now, it is understandable that till the introduction modern medical knowledge in India Āyurvedic practices comprised of teachings of different Indian philosophical thoughts. Arguably, in Āyurveda Vaiśeṣika and Sāṃkhya *darśanas* are constructed according to its own medical perspective, making it conducive to medical application and thought. Larson argues, "In discussion of 'essence' (*sāmānya*) and 'particularity' (*viśeṣa*), for example, in the

Sūtrasthāna portion of *Caraka* (1.1.45 and the following pages), these terms are not employed in their correct philosophical usage as categorical notions in ontology and epistemology, but, rather, as organic notions having to do with homeostasis and the disruption of homeostasis in a living body." (Larson, 1987: 1-2) This very mode of philosophical and logical learning of Indian medicine was fundamentally reconstituted by new tools of knowledge based primarily on Baconian philosophy of 'ordered experience' on the one hand, and utilitarian attitude toward learning on the other. Lord Macaulay and William Bentinck were first of the two utilitarians in India. "The first to declare that India needed a Bacon was Akshay Kumar Datta." Rajendralal Mitra was the other person. The fourth issue of *Vividartha* edited by him carried a long article on the "Baconian System of Philosophy". (Kumar, 2006: 60) Around 1600, Francis Bacon (1561–1626) distinguished between 'ordinary experience', based on chance observations and therefore subjective, and 'ordered experience', based on the results of methodological investigation and aspiring to a certain form of objectivity. (Tröhler, 2001: 42-45) Here, we can take some stocktaking of prevailing Indian mode of general education in Bengal of that period, "At the end of the course on credentials passed from teacher to student – the student's accomplishments were sufficient testimony to his proficiency." (Di Biona, 1981: 206) The Rev. William Adam, who found 2632 schools in a population of 5,875,000 persons, or 1 school to every 3230 inhabitants, carried out a survey in selected areas in Bengal and Bihar. (O'Malley, 1941: 649) He found that there existed about 1, 00, 00 village schools in Bengal and Bihar around the 1830s. (Williams, 1838)

Climatic challenge in India was another formidable factor which the British had to encounter. The time roughly between the middle of eighteenth and nineteenth centuries is crucial in the emergence of cultural construction of disease. "The geography of nations was now rewritten in terms of the language of health, disease, and medical technology." (Bewell, 1999: 30) The British lost their three quarters of troops, most of whom were Indian sepoys, from disease. It is reported, "the muscles and sinews of man could not hold against the perseverance of the boiling kettle..." (Headrick, 1981: 20-21) In this milieu, "The health of people's bodies would be guaranteed by ensuring the health of their physical environment." (Bewell, 1999: 31) The army and navy and the East India Company required large numbers of medical officers. These services offered situations

and advancement for large numbers of young men, and not only during the French wars. The army employed just 142 surgeons in 1793 but over 950 by 1815. Indian situations increased as the Company's domains grew. In 1793 the Bengal presidency directory listed 155 surgeons. By 1837 it included 379. Some of the assistants of 1793 had become full surgeons by 1816 but not many. The mortality of Indian service ensured that each year the Company's directors sought replacements, and the Company's 'Cadet papers' demonstrate there was no shortage of applicants. "Thomas Goldie Scott who arrived in Bengal as an assistant surgeon in the early-1840s received a discouraging letter from his father soon after. 'There is no doubt that the Indian Service offers great advantages', William Scott mused, 'but then how few live to reach that point ... '" (Stanley, 2003: 24)

It was the native's body which was of utmost importance to explore – the interiors of the body – to protect the colonial regime from contamination and, also, from unknown diseases. Moreover, "the imperialistic culture which offers the same metaphors to scientists and novelists, shapes both biology and literature by shaping the language through they express themselves." (Otis, 2000: 3) These metaphors were very often expressed in terms of *military* metaphors, metaphors of invasion like 'microbe hunters', 'interior resistance' etc. Such aggressive expressions were non-existent in āyurvedic notions – be it of body, health, disease, pathology or treatment. Ontologically, it carried the notion of man-nature harmony within its conceptual framework. (Zimmermann, 1999)

Against this backdrop, the Medical College of Calcutta was opened in 1835. Calcutta Medical College was the first institution in India imparting a systematic education in western medicine. The British East India Company established the Indian Medical Service (IMS) as early as 1764 to look after Europeans in British India IMS officers headed military and civilian hospitals in Bombay, Calcutta and Madras, and also accompanied the Company's ships and army. A utilitarian approach and the need to provide expert apothecaries, compounders, and dressers in different hospitals prompted the earliest official involvement with medical education in India. These subordinate assistants would help European doctors and surgeons who looked after the health of European civilians and military employees and also reduce the company's financial burdens by limiting the appointment of European doctors. Even the great scientist C. V.

Raman had to trenchantly comment against colonial educational policy, "The influence of powerful British interests which desired that India should be a producer of raw products and a consumer of British manufactures also tended in the same direction, namely, that of restricting engineering and scientific education in India to the minimum necessary for carrying on the British administration." (Raman, 1944: 42) In 1827 John Tyler, an Orientalist and the first superintendent of the Native Medical Institution (founded in 1820s) started lectures on Mathematics and Anatomy at the Sanskrit College. In general, the medical education provided by the colonial state at this stage involved parallel instructions in western and indigenous medical systems. Translation of western medical texts was encouraged and though dissection was not performed, clinical experience was a must. Trainee medical students had to attend different hospitals and dispensaries. Successful native doctors were absorbed into government jobs. But, "Anatomy was very imperfectly taught from plates and models and it was thought the vernacular medium did not further advance study and assimilation of the great treatises of European Medicine." (*Medical College Centenary Volume*, 1935: 7) The committee appointed for this purpose observed that "the entire omission of practical human anatomy in the course of medicine" (Crawford, 1914: 435) had resulted in a poor quality of medical students who would never be able to work at par with the English doctors required in the battle fields and for the governance of health of the subjugated people to be disciplined. Specifically speaking in Indian context, indigenous and Western systems of medicine had been congruous until the early nineteenth century, but anatomical study, cadaveric dissection, pathological anatomy and other developments in Western medicine had created a gulf that was never to be bridged. (Harrison, 2006) Surgical practices premised on modern anatomical knowledge was the fundamental distinguishing point between these two medical traditions. Indigenous practitioners were regarded as a danger from which the population had to be protected. (Hochmuth, 2006: 44)

As early as 1826 (during the period of Native Medical Institution) Dr. Breton wrote to Dr. Gilchrist, "Of all the sciences studied by the Asiatics, that of anatomy and medicine is the least understood and cultivated..." It was observed in the same letter, "Native doctors became indispensably necessary to afford medical aid to the *numerous detachments* from corps in the extensive dominion of India...The anatomical plates and

works published from time to time, for the use of the Native students..." (Breton, 1826: 24)

In another account it was revealed, "Indian medical establishment amounts to *seven-hundred and thirty* surgeons and assistant surgeons, and compare the number of these functionaries with the duties which they have to perform..." (*Parbury's Oriental Herald and Colonial Intelligencer*, 1835: 251) With the same breath, it was also noted, "the Brahmin and Hindoo youths amongst these medical students, have so completely overcome their prejudices as *to study anatomy from dead subjects by dissection*, with as much ardour as any pupil of a London hospital, the time is approaching when the higher duties of the profession...be left to native practitioners thus educated; in surgical operations, the delicacy of hand, and sharpness of eye *which distinguish the natives*, will, when combined with *competent knowledge*, render them *superior* even to the European practitioners." (*Parbury's Oriental Herald and Colonial Intelligencer*, 1835: 250-251)

In 1807 Dr. Buchanan – an East India Company doctor – observed, "Medicine is taught by several of Pandits, some of whom also, although they are *grammarians*, practise the art...has always been exclusively *literary* in character...and from *oral* tradition." (Mukhopadhyaya, 1974, Vol. II: 14) Dr. Martin found four types of Baidyas in Purnea – Atai Baidyas; or doctors who defraud the ignorant; Dehati Baidyas or village doctor; Chasa Baidyas or plough doctors; Haturya Baidyas or who attend the market. (Martin, 1838, Vol. III: 142) Important in his account is the reference to the presence of village physicians who also teach grammar, these physicians take up this profession as family art; some physicians do not practice medicine at all, but teach. Expectedly, these physicians never practice surgery, better not to speak of anatomy. They all deal with herbs and charms. Anatomical pathology or the notion of three-dimensional mapping of the body was completely absent.

Even Japan's experience of "introducing the very notion of anatomical approach to the body – the idea of visual inspection in dissection as the primary and most essential way of understanding the nature of the human body" was not found here. (Kuriyama, 1993) David Arnold notes, "the medical texts of early nineteenth-century India constitute an extended exercise in comparative physiology and pathology in which European and Indian bodies are constantly compared (despite the difficulty of obtaining Indian bodies

for dissection)." (Arnold, 2004: 257) He goes on to add, "colonial India became increasingly active in providing the kinds of anatomical data required in Europe, even to the extent of meeting its thirst for *human skulls*." (Arnold, 2004: 268) Interestingly, in 1935 – the year of foundation of Medical College, Calcutta – the English practitioner Edwin Lee commented, "the bodies of patients dying in the hospitals are examined, immense opportunities are afforded for the advancement of morbid anatomy..." (Waddington, 1973: 221) In the most sought after book for Medical College during that period was *The Anatomist's Vade-Mecum*. Robert Hooper wrote, "Fortunately for mankind, Anatomy is now become an indispensable branch of medical science; and throughout Europe we have every where distinguished teachers, who are daily adding to the stock of useful information." (Hooper, 1802: xx)

Dissection was required in every session (over 500 cadavers used in 1851) in addition to six terms of anatomy. "But to permeate the consciousness of the Indian masses, applied science in the form of surgery (*anatomy*) and the treatment of diseases (botany and chemistry) had to be successfully practiced by the doctor-scientists trained in Western methods." (Gorman, 1988: 295) Dr. H. H. Goodeve in his introductory lectures in 1848 remarked, "in less than two years from the foundation of the college, practical anatomy has completely become a portion of the necessary studies of the Hindu medical students as amongst their brethren in Europe and America. The practice of dissection has since advanced so rapidly that the magnificent rooms erected four years since, in which upwards of 500 bodies were dissected and operated upon in the course of last year, now amounting to upwards of 250 youths of all ...religions, and castes...as the more homogeneous frequenters of an European school." (*Medical College Centenary Volume*, 1935: 14) Bucklnad wrote, "...a large proportion of the corpses, instead of being burnt, were either thrown into the river, or consigned for dissection to the Medical College hospital, to be afterwards disposed of in the same way." (Buckland, 1901: 296) Think of the scenario! Though the first dissection was greeted with gun-salute, it also resulted in some amount popular furor. (Shastri, 2007: 105) George Smith writes, "How did Duff's Brahmin students and those of the Hindu college stand the test of time for the first dissection...the college gates were closed to prevent popular interruption of the awful act!" (Smith, 1879: 217-218) If we consider the actual practice of dissection, the

following account may be recollected. According to Mr. J. W. Kaye, "In 1837 – the first year of which a record was kept – sixty bodies were dissected before the students. In the next year, it was precisely doubled. In 1844 the number had risen to upwards of 500. The College (i.e. Medical College, Calcutta) was popular. There was evidently a strong desire on the part of the native youths for medical and surgical knowledge." (Deb, 1977: 70) Another report reads thus, "Flourishing the state of Medical College of Bengal... In another account, "It is deserving of mention, that from the month of November, 1846, to that of March, 1847, being a period of only five months, nearly 500 bodies had been dissected by the native students,--an astonishing number, when the prejudice to be overcome is considered..." (*London Medical Gazette*, 1847: 127) Within a span of 10 years, the number dead bodies available for dissection amounted to more than 500. In the first year of dissection, there were only 20 bodies available. "This was due in the first instance to a virtually unlimited supply of cadavers. From the humanitarian viewpoint this was a regrettable situation, but the fact is that the Indian medical student was at an advantage over his counter parts in Europe and America." (Gorman, 1988: 285-286) Advancement of anatomical education was made at the cost of the unclaimed bodies the poor Indian people. There was no like of Anatomy Act 1832 of UK to restrain the supply of the poor and wretched Indian dead bodies for the purpose of dissection. (Richardson, 2000) Only a handful exceptional people like Jeremy Bentham did donate their bodies for anatomical dissection. The dead bodies of the destitute would provide the entire supply of dead bodies in the government institutions and private medical schools in UK. (Richardson and Hurwitz, 1987)

In his "Introductory Address delivered at the opening of the Calcutta Medical College, March 17, 1836" M. J. Bramley, the Principal of the College, solemnly told his audience, "To practice medicine alone, to say nothing of surgery, without a knowledge of anatomy, would be as if mariner were to attempt to circumnavigate the world without either chart or compass." (*Calcutta Monthly Journal*, 1837: 5) He continued, "Look at the vast department of surgery, occupied by whom? By ignorant beings who know not a vein from artery, and who could not secure a comparatively small blood-vessel, however alarming the hemorrhage might be." (*Calcutta Monthly Journal*, 1837: xix) The particular terminology 'beings' must be taken into account. He was most likely talking of

the Native pundits who were during the time were employed in the College to assist English surgeons in translating their lecture into Bengali or other Indian languages. In this haughty note deep hatred for Indian medical knowledge deficient in anatomical proficiency is quite evident.

Dr. H. H. Goodeve, in his 'Introductory Lecture' on the same day at Medical College, told, "In the study of anatomy you, for the most part, require the exercise of memory only..." (*Calcutta Monthly Journal*, 1837: 19) Indian pupils coming to attend the classes at the Medical College were already trained in 'mnemonic verses' of Sanskrit texts. So, as might be assumed, there was not much difficulty in cramming European anatomical terms and teachings. He also told, "The trade of the quack will fail; he will be compelled to educate himself rationally and study his profession as science, or starve...Be assured that the formation of this noble institution...will be *death-blow to the reign of empiricism in India...*" (Ibid, 20) Needless to say, 'quacks' stand for āyurvedic practitioners and 'reign of empiricism' simply means gradual abolition of Āyurveda itself. Further, "The medical art in India, such as it is, is founded upon no knowledge of anatomy, no principles of physiology. It is utterly devoid of all pathological research – objects which must necessarily form the basis of all scientific enquiries upon the subject." (Ibid, 20) It is intriguing to note how scientific medical knowledge was going to be the only parameter of knowledge. And, most likely, āyurvedic practitioners are being equated with quacks. Like some other important experiments done and verified for the first time on the soil of India, the division between 'physic' and surgery was resolved for the first time at Medical College. In Goodeve's own language, "In former days physic was deemed a noble science, while surgery was considered a mere mechanical drudgery...In England, however, more especially in London, the separation still exists to a great extent." (Ibid, 20-21)

Only exceptional note at that session was the lecture on "General chemistry and natural philosophy" by W. B. O'Shaughnessy. He stressed on the learning of scientific knowledge as the tool to become independent of foreign dependence. (*Calcutta Monthly Journal*, 1837: 7-18)

To remember, "None of the colonies had replicated the British way of dealing the destitute poor by providing indoor relief to paupers in workhouses." (MacDonald, 2007:

49) The singular act of introduction of dissection-based anatomical knowledge in medical education brought in some permanent and indelible changes in the perception of body, disease, personhood and self of Indian population. This scientific breakthrough had enormous sociological consequences, for it opened the door of western medicine to the natives of India as practitioners and beneficiaries. (O'Malley, 1941: 366-369) O'Malley points out that dissection at the Calcutta Medical College was another example of the spirit of accommodation of Hinduism in the confrontation of the caste system with Western practice. This very act reconstituted 'psychologized' epistemology of Indian knowledge in favor of objective, value-neutral, clinical detachment. As dissection became the primary means to know the human body, the living body was regarded in bio-medicine as a kind of 'animated corpse'. The dissector/doctor claimed the status of an epistemologically privileged cultural arbiter on the question of death and dying. In colonial India, unlike England, this education was intended to produce 'capable practitioners' instead of a mix of 'capable enquirers and practitioners'. The study of anatomy entailed a division among: (a) disease and non-disease, (b) science, reason, and modernity on the one hand; and superstition, tradition, and backwardness on the other; and (c) physicians and non-physicians and social hierarchy among modern medical practitioners and all other indigenous practitioners. (*Indian Medical Gazette*, 1868: 87) The specific report "A Plea for Hakeems" categorically notes, "Under the British Rule, however, they (i.e. all types of traditional practitioners) have disappeared altogether from political life and socially have little or no standing in European society where they are virtually ignored."

The lived experience of the body was reconstructed to become measurable and repairable. The body became a three-dimensional space (not a two-dimensional physical frame through which saps and humours flow, as perceived in Āyurveda) into the depth of which temporal marks of disease could be excavated through the study of pathological anatomy. Physiology was understood to be changes in organic activities over *time* within a circumscribed *space*. In India too, medicine, like pre-industrial Europe, was inextricably linked to larger rhythms and to the community. Again, in scholarship in the Western tradition the sensitivity for temporal ordering dominates more and more. (Houben, 2002) Time perceived to the level of a fundamental principle probably reflects

the development of an agricultural economy. (Nakamura, 1992: 64) Time acquired new meaning and disciplinary authority through an equally abrupt entry of clocks and watches, and there was among some a sense of moving forward in consonance with its linear progress. Consequently, the learned literate knowledge/unlearned oral wisdom polarity arose.

Among many other things contact with a culture with superior perception of time, rationality and science instilled through its education and language – far removed from everyday speech and perception – helped create this unique ethos. (Srkar, 2002: 287) "The next significant technology of medicine to use time as its orienting focus is the clinical chart...Clinical charts thus provided clinicians with a comparative and comprehensive perspective on how their interventions influenced the illness, and so became visual health outcomes records." (Reiser, 2001: 33) We should recall that (a) examination of pulse was reframed within a rubric of 'universalized' time, rate/minute, though, not in its descriptive character as practiced by the āyurvedic healer (Lad, 2007), and (b) the use of stethoscope was instrumental to diagnose anatomo-physiological dys-functions inside the depth of the body (i.e. organ localization of disease) and ushered in miraculous *therapeutic* results instead of *prognosis* in āyurvedic practice. In addition, to add, all these were results of accurate anatomical knowledge of modern medicine.

It is useful to note that even in 18th century England the classical authors like Hippocrates and Galen "remained the standard works read by medical students at the English universities." (Jewson, 1974: 372) Now, regarding modern medicine it has used the *word* and the *line* to grasp the fleeting biographical and biological moments that fill and define the lives of the patients. In Indian context it entailed changes within two important aspects of Āyurveda: (a) narrative of illness – one of the two components of the 2-dimensional body – became marginalized, and (b) biological moments definable and compatible with humoral vicissitudes in āyurvedic medicine got stripped of its core and, consequently, reconstituted as an objective, replicable and reproducible data which correspond to the depth (volume) of the 3-dimensional body within which anatomical organs are localized. In Richardson's analysis, "Corpses used in medical education are traditionally "depersonalized and biography-less"...The humanity of disembodied specimens is easy to overlook, even to deny." (Richrdason, 2000a)

Papers on autopsy to corroborate clinical findings during disease were being regularly reported in the journal of *Medical and Physical Society of Calcutta.* One example can be cited now. At a meeting of the Society held on 7 February 1829, Mr. Agnew presented "a case of diseased heart with an account of dissection." (*Asiatic Journal and Monthly Register*, 1829: 323) Possibly, the example of Soorjo Coomar Goodeve Chuckerbutty best illustrates the fact of acquiring new knowledge of anatomy and dissection by the native students to find pathologies inside and to make correspondence with disease causation. One of his papers on heart disease was entitled "The Connection between Rheumatism, Pericarditis and Jaundice." In October 1864, he described twelve cases of long continued fever associated with maculated mulberry rash on the trunk, dusky red hue of the face, neck and hands. Postmortem was done. "The case records, post-mortem findings, critical analysis of symptoms presented in the paper, show that the diagnosis was very probably correct and thus this was the first account of typhus fever in India." (Sengupta, 1970: 186)

In medicine and related subjects, for example, students' interests and competence in dissection led to the establishment in as early as 1831 of a small hospital. One graduate, N. K. Gupta, who had been trained as an apothecary was apparently doing quite well in that position at the hospital. Other students trained as assistant surgeons were regularly attending "99 House Patients and 158 out ones." (Kopf, 1969: 184) In another account, we find that there were increasing numbers of "Surgical operations performed for expiration of tumours from various parts of the body, removing of cancer and other malignant parts, tying arteries..." Such measures, according to Dr. F. H. Brett, bear "sufficient evidence to prove what great benefit might be conferred on those destitute *creatures* by a well conducted and liberally supported institution, for as their confidence increases, and the means of relieving their wants, their number will also be greatly augmented." (*General Committee of the Fever Hospital and Municipal Improvements*, Vol. 7: 205) He emphasizes the superiority of 'Hospitals' over 'Dispensaries' in that article. Greatly relieved of their incurable diseases (amenable to simple surgeries in most cases) people, with their mixed feeling of awe, skepticism and reverence were getting inclined towards European hospitals. Mainly the 'destitute creatures' were the first of goers to these hospitals and dispensaries. Contemporary public press began to

manufacture opinion in favour of European surgery and therapeutics. (*Samachar Darpan*, 19 December 1835) Marginalization of the colonized people within the discourse of their own country is a legacy of colonialism that has proved difficult to eradicate; in India of the 1830s, this was just beginning. (Khaleeli, 2001) In Arnold's analysis, "Annesley and Twining were among the nineteenth-century physicians who saw themselves as contributing through their 'patient industry' to a wider scientific community beyond India as well as providing more immediate practical guidance for colleagues newly arrived from 'home'." (Arnold, 1995: 19) If the body can be separated from a person's selfhood and controlled, it can be corrected and improved. Medicine becomes a proper theme in development. (Nandy, 1995)

Some interesting facts can be cited here. For instructing modern medical knowledge to native students new hospitals were constructed. It served a number of purposes, namely – (i) carrying out dissection of the wretched and unclaimed bodies of poor Indians which was never possible within a system of āyurvedic *tols* and *gurukul* system, (Acharya, 1994) (ii) traditional educational practice of *text-as-authority* was reconstituted to learning through Baconian 'ordered experience' and experiment of clinical medicine, and (iii) as an offshoot of Christian charity, hospitals became the centers where the patient-as-object could be measured, repaired and experimented in a detached setting – away from his/her familiar domestic environment. Bedside medicine yielded to Hospital and, consequently, Laboratory medicine. Some interesting facts may be adduced here. The establishment of the Calcutta Medical College was a landmark in the development of scientific education in Bengal. The lecture was open to public and, it appears, these were attended. The amateur audience included in the early years of the college a very remarkable person, Akshay Kumar Datta. He became a major influence on the intellectual life of nineteenth-century Bengalis. (Ray Chaudhuri, 1996: 52) His Bengali book *Bahya Bastur Sahit Manab Prakritir Sambandha Bichar* (The Relationship of Human Nature with External Objects) is almost a direct transcription from George Coombe's *The Constitution of Man considered in relation to External Objects* (published in 1828 and sold approximately 3,50,000 copies between 1828 and 1900). Datta had only substituted and supplemented Coombe's data drawn from the European experience with evidence nearer home. Coombe's book itself was influenced by Baconian spirit and

heavily charged with 'positivist' and 'utilitarian' philosophies. Regarding Indian philosophers Datta woefully commented, "They were in want of someone to lead them. They were in need of one Bacon, one Bacon, and one Bacon."

The huge gap in figures of anatomical dissection, as discussed earlier, in Calcutta and London points to some glaring facts: (a) hospital admissions in the Medical College in Calcutta were of considerable number, (b) poor Indian destitute formed the bulk of this admission (and, ruefully enough, there was perhaps none to claim for their bodies after death in hospital and so could be used as an anatomical object for dissection), (c) there appeared well marked professional hierarchy at two levels – between indigenous practitioners and western-trained physicians on the one hand (Gupta, 1998), and between English and Indian physicians on the other. A report in this regard is informative, "In native society, all over the country, these men (i.e. traditional indigenous practitioners) have disappeared altogether from political life, and socially have little or no standing in European society, where they are virtually ignored." (*Indian Medical Gazette*, 1868: 87)

In 1839, before this situation emerged, Sir William Sleeman remarked, "there was not a considerable town or village without its practitioners, Hindu and Muslim. The educated classes sought the aid of European *surgeons* whenever they could obtain it, surgery being an art in which they felt *helpless*..." (O'Malley, 1941: 636) Regarding the rise of professionalism in medicine, Poonam Bala notes, "Regulation of medicine in India was to a great extent influenced by the policies in Britain at that time... In India, the medical profession can be seen as a branch of the Army medical services which held sway over the medical profession... While in Britain, State intervention was in terms of regulating private practice, in India, practitioners were in State employment." (Bala, 1991: 67, 69, 71; Arnold, 1996) The power of the medical profession lies in its success in having secured by political means a legal monopoly over the practice of healing in contemporary society. American experience reveals to us, "the identification of the profession with *autonomy* enabled the American profession to invest itself with the authority and prestige of the most advanced European medical science and distinguished itself from midwives, folk healers, the clergy, and other rivals." (Sappol, 2001: 2) In Indian context, the extent of ramification of medical ideas can be gauged to an extent by the number of medical journals. By the end of the nineteenth century there were as many

as fifty medical journals in the Indian languages. (Panikkar, 2001: 165) Between 1912 and 1917, a number of Medical acts set up Medical Councils in the various provinces, and laid down qualifications for registration of medical practitioners that excluded traditional physicians, and made it illegal for a registered practitioner to be associated with Indian medicine. (Patterson, 2001: 120)

A Bengali magazine *Jñānānveṣan* (Search for Knowledge) reports on 26 March 1836, "It is seen everyday how much harm is committed due to lack of just treatment. Lacking right treatment people are dying every hour due to fallacious knowledge of uneducated vaidyas. The number of people who are dying will possibly outnumber the total of dead people in India." (Bandyopadhyaya, 1994: 38) It reveals the attitude of a section of educated Bengali people towards traditional treatment. Even common people were not exempt from this sentiment or mindset. Though, questions of religious beliefs and local customs came up to confront the advent of Western medicine from its 'enclave' origin to public health program. Small pox, cholera and plague, to name a few, were such contested areas. (Bhattacharya, Harrison and Worboys, 2005) Nevertheless, powerful therapeutics of Western medicine and the introduction of anatomical knowledge in medical curricula tilted the dialogue between East and West towards the later. Western medical practice was involved with better social position and monetary gain.

So, patients, being increasingly divorced now from their domestic setting and transported to hospital setting, were made amenable to completely new technologies of time measurement and case histories. They began to experience an altogether different form of subjectivity – incomprehensible so far and aggressive. One example may further help to understand it. In a letter to the editor of The Englishman, an English man complains about Medical College and Hospitals, "Enter and you will find East Indians and West Indians, Bengalees and Madrasees...These creatures wear the same clothes, and lie on, and use, the same beds and beddings as the Europeans; and as soon as they don the clothes they are *yclept* sahibs! They are of all classes; and (as all patients are distinguished not by *name*, but by *numbers*), were one to ask for "Now Number Sahib"..." (Ray Choudhury, 1987: 4) Besides social hierarchy, it is interesting to note how patients became numbers. In other words, person was transformed into patient in the hospital setting. Person of the patient got transformed into pathology inside the body. It

reminds us of clinical objectification of modern medicine. It also reminds us of careful separation between the White and 'black' bodies.

IV Interface of Both Knowledge Systems and Reconstitution of Āyurvedic Knowledge

To know and combat diseases in alien environment the British had to depend on anatomical dissection of the native body on the one hand, and to control environment or the space surrounding the body. There occurred an epistemological break in the sense that there was no "perfect association between appearance and disease." (Fredriksen, 2002) A mechanistic model of the body compounded this in the aftermath of Newtonian revolution in physics, Cartesian philosophy, and Galilean mathematical explanation of physical bodies. A new paradigm emerged: models > logical deduction > theorem or result. However, the Indian approach remained to be: observation > algorithm > validated conclusion. (Narasimha, 2003)

In *Bengal Gazette*, 12 August 1780, a poem "*Calcutta in the Rains*" was published:

> Where insects settle on your meat,
> where scorpions crawl beneath your feet
> and deadly snakes infest;
> mosquito's ceaseless teasing sound
> and jackals' direful howl confound
> destroy your balmy rest. (Vernede, 1995: 70)

By the early nineteenth century, the "native of Bengal" had come to symbolize all that was despicable in the colonized race. The common illnesses reported were dysentery and various fevers, treated summarily by Company physicians with doses of brandy, mercury or bleeding. In March 1862, Prof. Longmore, of Netley, gave the following evidence before the Royal Commission on the sanitary state of the Indian Army, "As regards the chief part of this extensive city (Calcutta) – that inhabited by the native population – the pestilential condition of the surface-drains and yards, and many of the tanks among – the huts and houses, would not be credited by any one who had not been among them." (*Nature*, 1871: 150) In 1860, the cholera deaths were 6,553, and in 1866,

they were 6,823. The notion of geographical pathology was constructed which waited to be properly ordered and 'improved' by the Colonizers. What a comedy of errors, though willful and intentional!

In a similar way, the space of Calcutta and the bodies inside this space were fit into this project of 'improvement'. "Plants, minerals, morbid specimen, skulls, medicinal samples, natural history drawings and letters reached these institutions (like the Asiatic Society) in Calcutta, and from there, they often sailed ship to London, Edinburgh, and other metropolitan centers." (Pande, 2005) There were two faces of Calcutta – a pathological space, and the colonial centre of calculation (as Latour clinches the point).

To control this pathological space and to "civilize" the native bodies there came up the importance of public health emerging out of its 'enclave' origin. The focus of the nineteenth-century public health "became the zone which separated anatomical space from environmental space, and its regime of hygiene developed as the monitoring matter which crossed between these two great spaces..." (Armstrong, 1993) Sanitary science dissected the mass and recognized separable and calculable individuality in the form of anatomical/corporeal space in the crowd – though not the singularity of individual difference. Ignorance of Indian context is revealed in the 1st census of Indian Empire in 1871. Scholars have argued that "the wisdom of trying to impose on the Indian people a category – in this case, age – that worked well in a Western context but did not easily translate into useful data when exported abroad. In short, they realized that even so putatively 'universal' a category might be impossible to determine accurately in a culture that lacked certain assumptions about time, and in a state that lacked the resources to record the dates of births and deaths." (Alborn, 1999: 64) Ignorance became glaring when after the 1872 census in Bengal, Beverley, the provincial registrar, observed that "[t]he population of Bengal rose in one day from 42 to 67 millions," and quipped, "[t]he Lieutenant-Governor . . . suddenly found that he had unconsciously been the ruler of an additional population more than equal to that of the whole of England and Wales." Many books were written to guide the White settlers in India. One such was "Medical Hints for Hot Climates and For Those out of Reach of Professional Aid." (Heaton, 1897) Some of the suggestions were:

1) To get up late in the morning and take breakfast or light food at 11-30 am. "Do not eat too much at a time; i.e., be content with satiety and leave off with an appetite." (Heaton, 1897: 3-4)

2) To take regular bath.

3) To take decoction of *chirata* (a traditional herb used by Indians to increase appetite) and *bael* (it is mildly astringent and is used in India for dysentery and diarrhoea; the pulp may be eaten or the decoction administered. It is said to cure without creating any tendency to constipation.) (Heaton, 1897: 140) It was also observed, "there are certain days on which meat killed quickly turns putrid, and that such seasons have been noticed as marked by humidity, closeness, or stillness of the atmosphere." (Moore, 1862: 20) Therefore, local Indian knowledge was incorporated within the therapeutics of Western medicine for everyday purpose. But this had little effect on overall Western medical knowledge. When two culture groups come face to face they are confronted with the barrier of language. It hinders a deep and meaningful process of mutual appreciation and cultural exchange. When the British emerged to be the ruler of India, "The British mode of living in India provided cultural blocks to their acquisition of knowledge beyond their problem with language." (Cohn, 2004: 19) Hence, there was a deluge of translation of Indian texts. Therefore, "Seen as a corpus, these texts signal the invasion of an epistemological space occupied by a great number of diverse Indian scholars." (Cohn, 2004: 21)

It can be summarized as:

(1) At the interface of two cultures exchanges occur at various levels with different responses, namely, (a) upper echelons of a given society, (b) middle class, if any, and (c) lower rung of the society.

(2) More powerful culture (with its political and economic background) pursues the *modus operandi* through (a) *interaction* (or, knowing the object), (b) *assimilation* and *experimentation* (knowing the nature of the object – which turns out to be an ontological question), (c) *transformation* (reconstituting the object in an artificial environment), and (d) *dissemination* (exporting it to its root – original cultural context – which may be regarded as an epistemological question).

(3) In tandem with the last one (dissemination) dislocation occurs at idioms of expression or understanding in both the cultures. For example, while exploring Tropical medical space (including India) "germ theory" was dislocated by the rise of parasitology, and, finally, giving rise to Tropical Medicine. Simultaneously, there was reconstruction of Āyurvedic knowledge of anatomy and it began to be read and interpreted in the light of modern medical/anatomical knowledge. 'philosophical/speculative' anatomy was reconstituted by modern anatomical knowledge.

We shall now try to see how all these exchanges and changes occurred at the level of both epistemology and ontology of Indian knowledge pattern. While talking about the English East India Company, Patterson observes, "The early traders faced formidable medical problems, and, at first, they were eager to learn anything they could from the local medical practitioners...Faced with a continuing high mortality the Europeans noticed that Indians were relatively immune to some of the local diseases. This led to the policy of 'Indianisation': the attempt to make the blood of the Europeans more like that of the Indian, and so make him more resistant to Indian disease." (Patterson, 2001: 110) With the success of the first English expeditions, the import of drugs into England increased markedly: the portion of drugs imported from outside Europe in 1588 was 14%, in 1621 48% and in 1669 70%, of which the majority had come from India and the East Indies. (Patterson, 2001: 111) Connected closely with the issue of medicine was the question of botanical identification of plants and herbs in use for pharmacological purposes. Gerard Koenig, a student of Carl Linneaus, realized that a better understanding of Sanskrit would open the world of medical values of these plants. He observed, "Some hundreds of plants, which are yet imperfectly known to European botanists...grow wild on the plains and forests of India." (Baber, 1998: 56) Garcia de Orta's knowledge of Indian plants opened up a new world of Western botanical taxonomy. "The developing *British Pharmacopoeia* in Britain at the time was then a precursor to these developments." (Bala: 1991: 63) More evidences may be found from the use of Rauwolfia (Sommers, 1958) (*sarpagandha*) and cotton wool (which was originally produced in India) for wound dressing. (Elliott, 1957)

But at a later period during the mid-nineteenth century, things began to change. Western interest was confined not only to taxonomy or morphology of a plant. Plants

were scrutinized through chemical tests and to separate its constituents which could be artificially produced in laboratories and, then, in factories. John Stenhouse presented a paper before the Royal Society on December 6, 1855. The paper title was "Examination of select Vegetable Products from India. These Vegetable Products were *Datisca cannabina*, *Ptychotis Ajowan*, and *the Decamalee Gum of Scinde*. His effort for "last twelve months has been chiefly directed to three of these vegetable substances..." (Stenhouse, 1856)

Bala finds that the simultaneous flourishing of indigenous and Western forms of medicine was not only because of state patronage but also because of the similar basis of treatment and diagnosis so that one system did not threaten the other. But, after knowing the extracts of a plant and herb (along with synthetic chemical production of drugs) the chemical and drug industry in Britain flourished like giants. So, "the rise of the chemical and drug industry and the growing profession of medicine in Britain created a vast gulf between Indian and Western medical sciences which was getting wider day by day...it could not be breached." (Bala, 1991: 64) As mentioned earlier, the phase of interaction passed over to the phase of assimilation and experimentation and more. All these are carried to the 'centers of calculation' and "every domain enters the 'sure path of science' when its spokespersons have so many allies on their side. The tiny number of scientists is more than balanced by the large number of resources they are able to muster." (Latour, 1999: 232) Here, in the 'centers of calculation' these facts are standardized and "*additional* work is done inside the centers to mop up the inscriptions and reverse the balance of forces once more." (Latour, 1999: 233) Such recurring cycles, according to Latour, give metropolitan science its steadily increasing claims to universal knowledge.

During the first half of the nineteenth century, however, the drive for 'westernization', both secular and religious, had been growing. The only course for India was thought to lie in abandoning Indian ways, and arranging for all education to be on western lines. This resulted in a complete reversal of the earlier liberal attitude of Europeans to Indian culture, including medicine. (Patterson, 2001: 119) Thus, modern European science is ontologically linked to the growth of European colonialism. (Chakrabarti, 2004) This ontological question is also intertwined with centre-periphery epistemological question. Our assumptions about what it is to be human, about what it is

to be a person, correlate with deeply held convictions about what constitutes a human and a supposedly 'normal body.' (Canguilhem, 1978; Davis, 1995) During the mid-nineteenth century, the notion of the norm, of normalcy, and the normal body evolved. A 'normalizing regime' or 'regime of normalcy' emerged out of the idea that there exists a normal standard to which all bodies must and should conform. "Shifting power relationships in the colonies, together with new intellectual currents emanating from the metropole, wrought a profound change in the way Europeans came to see their *bodies* in relation to their subjects and the tropical *environment*." (Harrison, 1996)

Assimilation of modern Western anatomical ideas to explain internal dynamics of Āyurveda and to judge all ancient works in 'scientific' light (bearing equivalence to being 'civilized') gradually became the call of the day. Such an effort is perhaps aptly illustrated in a 1924 book *Sharir Parichay* (Introduction to Anatomy), purportedly to resurrect old Āyurvedic knowledge of anatomy, written by an eminent English-educated *kaviraj* Gananath Sen. (Sen, 1924)

In his book Gananath emphasized on a journey from atlas to cadaver to dissection for properly gaining anatomical knowledge. He informed the readers, "[anatomy] is first and foremost basis of Āyurveda." (Sen, 1924: 1) According to him, to gain comprehensive knowledge of a difficult subject like anatomy one must first learn from atlases and *gurupadesha* (advice from guru), "then through dissection that knowledge has to be testified. If one does not have any knowledge of the subject from the beginning only dissection cannot yield any fruitful result." (Sen, 1924: 2) Throughout the book, he reproduced diagrams and figures from different textbooks of anatomy taught in medical colleges. Ancient Āyurvedic anatomical terms of entirely different connotations were conflated with modern concepts. In his book, he quickly turned to discover examples of 'germ theory of disease' even in ancient Ayurvedic texts. Here 'germ theory' acted as a *metonymy* of power. As a result, he, perhaps inadvertently, opened up a space of Foucauldian clinical *gaze*. Through this new mode of conceptualization there occurred first, a spatial shift in perception from macrocosmic-microcosmic arrangement of the "Indian" body to the circumscribed, three-dimensional anatomical space, and second, a shift from traditional philosophy of *tri-doṣa* theory to 'modern' notion of organ localization of disease. In another of his later books, he told that 'renaissance' of

Āyurveda was brought about by the very act of cadaveric dissection by Madhusudan Gupta in 1836. (Sen, 1944: 31)

It was no wonder that the philosophical matrix of Āyurveda was dislocated through this 'modernization' of Āyurvedic knowledge of anatomy. Post-Renaissance medical concepts insinuated into the interstices of classical Āyurvedic concepts and reconstituted their meanings. Gananath's epistemological inquiries were surreptitiously assimilated and reconfigured by metonymic language-metaphors of modern anatomy. Consequently, the Āyurvedic body as a self-reflexive and active agency began to metamorphose into an inert dead body – an 'object'. It can be understood through Peircian concept of index-symbol-icon. It is through the reconstruction of the indexical parts of a sign system the entire symbolic order can be reconstructed insidiously – without changing the sign-uses of a local cosmos. Its use might spawn a rethinking of the symbol, a new idea, an idea that might change other ideas, change habits and hence change 'actual behavior in the outer world' in a continuous dialectical process. (Peirce, 1955: 283-288; Mines, 1977) Such a process was in operation and the Sanskritik connotations of organs described in Âyurveda were evacuated of its meanings. That vacuum was filled in by modern anatomical meanings and metaphors. Consequently, context-sensitive character of Āyurveda was metonymically refigured by context-free, universal logic of modern medicine. It was again enhanced by excellent therapeutic results and diagnostic aids like stethoscope, microscope, and x-ray. This becomes an illuminating example of how idioms of expression unique to a particular set of epistemology can be insidiously transformed and a new hegemony of text can operate. "In a complex civilization, as culture changes and innovations are introduced, healers and patients must continually adapt their perspectives to one another... healing systems adjust to the conditions imposed by the general culture and by one another." (Trawick, 1993: 133) Floating signifiers being substituted by circumscribed scientific metonymies led to where "contingent figures of chances masqueraded deceptively as figures of necessity" and "metonymies are assimilated with metaphors with which they are contiguously associated." (Culler, 1981: 220-222) In another instance Gananath Sen writes, "I am here to appeal to your justice to give Ayurveda its share of consideration in the great work of Renaissance set upon you by a kind Providence and benign Government ... We mean to

employ the lever of our Western education to turn over these ruins." (Sen, 1916) It was actually an address delivered at the Hindu University Foundation Ceremony, Benares.

A different example in this regard would be Kanailal Dey (Kanny Lall Dey, as he wrote of himself) who was a distinguished physician of the late nineteenth century. He lamented for excluding indigenous herbal drugs in the latest list of drugs by the Government of India, He, in a submissive note, beseeched that other indigenous drugs would be employed in the Medical Depots if they could be obtained pure and price not exceeding that at which they can be imported. (Dey, 1896)

As an aside, in another important Āyurvedic textbook published in 1890 the position of *garbhāśāya* (ovary) is thought to be in between *pittāśāya* (gall bladder) and *pakvāśāya* (stomach). (Sengupta and Sengupta, 1890: 10) Sheer lack of anatomical dissection and knowledge leads to such conclusions. Interestingly, unlike Gananath Sen the compilers of this book were not trained in English education. It must be remembered that the epistemological root of Āyurveda was constituted in pre-colonial social milieu. But it was getting dislocated and displaced in the new socio-economic context when the emergence of market was a formidable phenomenon to cope with. There was "An important trope, even in the nineteenth century" that deemed "India as a seat of decaying knowledge: this Indian knowledge was ultimately 'our' knowledge, though in a distorted form." (Bayly, 1994: 8)

Conclusion

Some historians find that up to the twelfth century there was no great difference between the east and the west with respect to scientific ideas. However, "After the twelfth century western science alone progressed and only the vestiges of earlier knowledge, together with a variety of technological and metallurgical skills persisted until the time when British rule was established." (Larwood, 1958: 36) The debate about Indian medicine during the early period of the nineteenth century was at a profound level a debate about the status of European knowledge and the social standing of its vulnerable practitioners. "It was about class-formation in British society, which is one reason for the vitriolic denunciation of the wiles of the Brahmins." (Bayly, 1994: 2) The British search for and categorization of Indian medical knowledge proceeded by compiling detailed inventories of indigenous remedies. This was done by translating the āyurvedic texts, by collecting the specimens they found in the dispensaries of the bazaars (the pansaris), but above all by means of the medical pharmacopoeia. "Pharmacopoeia was a textual window through which transactions in knowledge could take place." (Bayly, 1994: 2)

Throughout the dissertation examples revealing superiority of western knowledge and technology have been given. It may be remembered again, anatomical knowledge is also a technology (not in the sense of instruments) which influenced perception of the body in a completely new way. It was a unique method to delve into the depth of the body. Considering the age of medical knowledge since antiquity (which has been persisting for more than 2500 years) this new knowledge of anatomy is of only 500 years. But it has changed everything regarding disease perception, construction of self and individuality, and, also, mindset of a given population. Here lies the importance of study of anatomical knowledge in its historical background.

When thought of in the context of India anatomical knowledge is often co-terminous with modernity, civilization and improvement of a nation. Possibly, as hindsight, this was the reason why Ram Mohan Roy in his famous letter to Lord Amherst stressed the importance of studying anatomy among other advanced branches of knowledge of modern Europe. Nevertheless, as Partha Chatterjee notes, "There must be something in the very process of our becoming modern...even in our

acceptance of modernity...a certain skepticism about its values and consequences." (Chatterjee, 1998: 275)

In an unusual letter to some J. N. Batten on 1st January 1836 (the year of the first cadaveric dissection in India in the same month, on 10th January) Dwarakanath Tagore wrote about converting "200 good Hindu boys by giving them the holy water that comes from Corbonell & Co". (Tagore, 1836) We should remember that Dwarakanath was the person to provide stipend for the first batch of four medical graduates from Calcutta Medical College to pursue their higher medical study in Britain.

Ram Mohan and Dwrakanath were not the only persons to show their avidity for modern scientific knowledge including anatomy. Keshub Chander Sen, one of the foremost exponents of modern India, exhorted his compatriots to "assiduously and reverently cultivate the sciences", as "Anatomy and Physiology, Geology and Astronomy, Chemistry and Zoology" were "living preachers" that provided "saving wisdom". (Lourdusamy, 2004: 11) However, one of the contentious issues of this dissertation is that acquisition of anatomical knowledge (not to speak of other areas of sciences) was not an original one it was derivative in nature. Another issue is that Indian medical education system was a test laboratory in some senses where new educational policies were first implemented. Final issue in this regard is that in mimicry of professionalized modern medicine "reinforced now by the elements from Western medicine" there occurred "professionalisation of Āyurveda and its consequences, such as the establishment of Āyurvedic colleges." (Meulenbeld, 1995: 10)

Now it may be relevant to tell a few words regarding modern institutions and their activities in colonial India. Asiatic Society of Bengal was set up in 1784. In the first hundred years of its existence, "among nearly a thousand contributors to the journals and proceedings of the society, there were only forty-eight Indians; of these, only the polymath Rajendralal was a regular contributor." (Chatterjee, 1996: 11) Such sorts of examples reveal the nature of the production of colonial knowledge about India. Indian participation was usually very meager due to a number of reasons. Because of which no new research possibilities were in the offing, barring a few examples of J. C. Bose, P. C. Ray, C. V. Raman, Satyendra Nath Bose, and U. N Brahmachari. Not to miss here, Ronald Ross was not Indian. He left India just on

completion of his historical malaria research. This picture becomes darker when it comes to the field of anatomy.

An example can be cited here. Dr. N. Pan, Professor of Anatomy, Medical College, Calcutta, wrote an article titled "Some Observation on the Gastro-Intestinal Tract of the Hindus" in the *Journal of Anatomy* in 1919. In that article he wrote, "The nature of the diet in Indians differs considerably from that of Europeans. In an Indian diet we find a bulky carbohydrate food with a very small proportion of the other proximate principles. This led me to expect that the anatomy of the gastro-intestinal tract in Indians would differ from that of Europeans to a considerable degree...The observations were made on 65 subjects, a very small number, and the conclusions drawn from these cases must be accepted with caution." (Pan, 1919: 259) Even a cursory look at the initial sentence will make it clear that the anatomical study undertaken by Dr. Pan was a comparative study, not any exploration into new findings (examples of William Hunter, Bichat, William Harvey or Richard Lower is helpful in this regard). But more interesting issue is the next part of his observation, "The subjects available for dissection in the Calcutta Medical College are the unclaimed bodies from the Campbell Medical School and Hospital where the majority of the patients come from the poor classes. Mahamedans (sic. Mohammedans) take a fair proportion of meat in their diet, but no Mahamedan subjects are available for observation. So most of the subjects observed are adult Hindus including Bengalis, Beharis and Uriyas (sic. Oriya), who subsist on bulky carbohydrate food." (Pan, 1919: 259) Some facts become evident from the statement – (1) bodies for dissection "come from the poor classes". Obviously, these are unclaimed bodies. As the number of bodies was abundant any sort of replica of Anatomy Act of 1832 in England was not called into action here. (2) No 'Mohammedan' subject was available for dissection. This may be due to the fact that this class of people was loathsome to hand over their bodies to persons of different or alien religion. One more evidence in this regard may help to realize it. Charles R. Francis in one of his addresses in 1868 informed the new students of Medical College, Calcutta, about a 'moribund pauper' and 'poor wretched skeleton figure'. He told, "The police have brought him to great haven of refuge, the Medical College Hospital of Bengal." (Francis, 1868: 99) Dr. Francis' statement points to the fact of abundance of pauper and poor people's bodies for dissection.

"Surgery, it was argued, was based upon anatomical 'fact' – the observable materiality of the body – while physic was based upon speculation and imagination." (Doyle, 2008: 17) Surgical knowledge, based upon sound knowledge of anatomy, in its turn performed the most commanding job in consolidation of modern medical authority in Indian subcontinent. The rise of surgery during the 19th century charts changes to the nature of disease and the ontology of the body within science. Moreover, Surgery's promotion of anatomy as the basis of scientific knowledge helped to redefine the anatomical body as the site of medical inquiry. To note, the practice of surgery was specifically related to the consolidation of British imperial power. Thomas Chevalier, an important personality of surgery of the 18^{th}-19^{th} century, wrote in 1797, "It should be remembered that the benefits of those improvements in Surgery which have been made in this country, are by no means confined within our own borders. They have extended to foreign climes..." (Chevallier, 1797: 49) He further added, "And what is of more Importance...is that they have reached the sister kingdom and all the immense colonies of this extensive empire...receiving solace, relief and restoration, through the assistance of men...and the example of the Surgeons of London." (Chevallier, 1797: 49)

Some Indian example may help to clarify it. The decision to establish a Native Hospital in Calcutta was taken in 1792. It was reported in *Calcutta Gazette* on 18 October 1792 – "The institution of the hospital for such of the natives as Providence is pleased to inflict with sickness or casualty, reflects additional credit on the characteristic of humanity..." (Seton-Karr, 1865, Vol. II: 355) The reason behind this effort is worth noticing. During those early years of British colonization in Calcutta new industries were being established. It resulted in huge number of injuries like lacerated wound, fracture of bones, serious damage of the limbs. Following such activities, on 1^{st} September 1794 native Hospital outdoor started on Tuesdays and Fridays to primarily give medicines to the injured from accidents. Consequently, arrangements were done for people ready to undergo surgical treatment. (Lushington, 1824: 313-321) The number of patients suffering from accidental injuries was as follows: **1794-95 – 67, 1795-96 – 108, 1796-97 – 182.** (*Calcutta Gazette*, 1795-1797)

It makes clear of the fact that accidental injuries, which was of great concern among the labouring people, was more or less duly taken care of by the English surgeons. Traditional medical practices utterly failed in this particular area. In his

experience in Madras in the early years of nineteenth century, James Forbes saw that though Brahmins "have risen superior to prejudice" in case of vaccination they were not engaged in any sort of surgical practices. Regarding surgical practices "They do not bleed, nor perform any surgical operation, unless the removal of a part partially divided." (Forbes, 1813, Vol. III: 422-430) Again, "All cases of fractures and dislocations are consigned to the potters, a caste of people abounding in Hindoostan, for making the water jars..." (Forbes, 1813, Vol. III: 430)

In 1836, after the foundation of Medical College, Dr. F. H. Brett, in his report "Prospectus of the Central Hospital and Hospital of Surgery, Calcutta", writes, "In the space of two months and without a complete establishment, with the resources of the Bazzar and Native Hakeems...the number of Surgical operations performed" which were for "extirpation of tumours from various parts of the body, removing of cancers and other malignant morbid parts, tying arteries, cutting for stone...amounting to eighty-four extirpation of the parotid gland..." (*General Committee of the Fever Hospital and Municipal Improvements*, 205) He seems confident of conferring "great benefit...on those destitute creatures." (Ibid, 205) To perform surgery in a better way he prioritizes Hospital over Dispensary. In his opinion, in a Hospital a patient "is never lost sight of by his Medical attendant", whereas in Dispensary "disease cannot be watched." (Ibid, 205)

A Military Medical Student in his memoirs reflects on his studentship in 1880s, "In the medical wards the days of bleeding and drastic purging had passed" and, he reminisced, "The scope of the operative work was of course much more limited then. The only abdominal operation I saw was the removal of an ovarian cyst by Dr. Harvey." (*Centenary Volume*, 1935: 154-161) Rather, he adds that minor surgeries like 'evacuation' of hydrocele caused much relief to the patient. "The patient went on his way rejoicing...and spread abroad the *fame* of the hospital where a radical (?) cure had been effected so speedily." (*Centenary Volume*, 1935: 159; Kopf, 1969) This experience of Medical College, Calcutta, in 1880s may be compared with early medical education in England. "Operations on the cavities of the body, except 'cutting for stone', were rare and seldom undertaken except in hospitals or hospital surgeons...and the most notorious 'cutting for stone' with a crude death-rate at least 20 per cent." (Singer and Holloway, 1960: 3) Besides this surgical aspect of colonial medicine, a few more issues should be considered now. Early nineteenth-century

medical training in England was extremely diverse. While some practitioners held university degrees from the most respected medical colleges of the world, some were apprenticed to apothecaries where they "spent most of their time capping bottles and rolling pills". (Youngson, 1979: 12) Still others were quacks and drug peddlers who practiced freely with no legal sanctions against them. Private training in anatomy and other clinical subjects further complicated the whole issue there. (Lawrence, 1988)

Part of the problem with educating and licensing doctors in England was in the conflicting struggle for rights and power between licensing bodies; there were nineteen of them in the United Kingdom alone. (Petersson, 1978) Moreover, there were divisions among physicians, surgeons and apothecaries. Physicians would be gentlemen of high origin and socially accepted. Surgeons were given a lower status. In Indian context, this scenario was altered. Contrarily, in India, the highest status one medical practitioner could get was Civil Surgeon. Here the divide between physicians and surgeons was not apparent, nor was it articulated in medical curricula. So, the Indian experience might have helped to sort out the problem in England too. Also, to note that from the very beginning of Medical College it was state-owned. The licensing authority in India was always the colonial state. This experience too might have come up to review the question of private education in England. "Important, too, in changing European attitudes was the growing professionalism of doctors trained and qualified by European medical schools...and dispatched in significant numbers to the expanding outposts of empire." (Arnold, 1988: 12) This observation, if coupled with that Chevalier with respect to surgeons and their practices in the colonies, leads to the fact that India (and Calcutta) was a kind of 'laboratory' to test various medical theories and administrative practices.

Additionally, as cited above, Dr. Goodeve in his lecture exhorted his students, "clinical lectures will from time to time be delivered to you upon such cases of interest as you may meet with in the hospital. Again, "It is only at the bedside of the sick, by observing closely the symptoms and progress of disease, watching the effects of remedies...and the *death of your patient afford you an opportunity to inspect the body*. Moreover, "it is only by these means that you can hope to render yourselves worthy and useful members of the profession you have chosen." (*Calcutta Monthly Journal* 1836, 25) Here stress is laid on clinical cases at hospital and hospital, in turn, providing the opportunity to learn pathological anatomy.

To sum up, a number of new features emerged which gave colonial medicine its distinct shape to distance it from traditional healing practices. These may be enumerated thus – (1) *centrality of medical knowledge* – anatomical knowledge constituted its distinctive feature. (2) *Valorization of the hospital* – for anatomical dissection and surgical operation its existence was almost mandatory. Besides anatomo-surgical issues it was also necessary for clinical knowledge to study an individual patient at his bedside. (3) *ubiquity of lesions* – this new knowledge of medicine based on anatomical pathology did result in permanent departure from the long legacy of humoral pathology. To give one example, John Peet ,writes in 1864, "By disease is to be understood an altered condition of the fluid and solid constituents of the body." (Peet, 1864: 1) We must note the tone of humoral lingering in "fluid or solid constituents". In Mark Harrison's observation, "Although Western medicine was already distinctive in terms of its anatomical knowledge by the mid-seventeenth century, it maintained essential similarities with the humoral outlook of Indian medical systems until the early nineteenth century..." (Harrison, 1999: 223) (4) *Emergence of professionalism and medical researches* – Charles Morehead's work is pioneering in this regard. He wrote, "The graduates of the Indian Medical Colleges, for whose benefit I have chiefly written, may often, for many years yet to come, be placed in positions remote from their professional brethren, and in circumstances ill adapted for the prosecution of pathological research." (Morehead, 1860: xi) (5) *The medicalization of life* – this particular concept was to be felt only after the arrival, extension and consolidation of Western medical practice. It started from demographic study to prison house to dispensaries to school level. In the context of medical specialization, George Weisz notes, "during the past centuries the evolution of modern Western societies has moved so vigorously in the direction of increasing specialization of labor, knowledge, and expertise that it would be quite astonishing if medicine had failed to follow this path." (Wiesz, 2003: 538)

As noted above, Indian medical practitioners began to publish medical journals like *Indian Medical Gazette* and *Calcutta Medical Gazette*. Publication of these journals did have material ground. From 1792 to 1823 the number of patients being treated at the hospital at Dharmatala, Calcutta was of astounding value. The figure is – 1794—247 persons, 1795—420, 1796—495, 1797—616, 1800—2024,

1823—41166. The total number is 358865 (*Samachar Darpan*, 11 June 1825). Such huge number of patients when remain under physicians' gaze in the hospital is sufficient for any research work. It was unthinkable in pre-colonial India.

It heralded a new horizon for medical professionalization. In Indian context, unlike western societies, the whole of society did never participate in this process. This process was confined to the upper echelon of society. One of the outcomes of this particular phenomenon is that to the most of the people of India western medicine was not the first choice for treatment. Traditional healing practices like Āyurveda, was there to fill in the void. But persistent effort on behalf of the educated class was put to make English medicine popular. It was oftentimes reported in *Samachar Darpan*, "Those people who have witnessed wisdom of the English physician have come to realize that so many people do not recover when they fall victim to the treatment of indigenous physicians. But they survive when they come under judicious and laborious treatment of the English physicians." (*Samachar Darpan* 13 June 1818)

During cholera epidemics in Calcutta Native doctors trained in Native Medical and, later, in Medical College reached out to the afflicted people at different locations. They did their best to alleviate sufferings of the ailing people. Moreover, especially during cholera, new European remedies like that one made to use by Dr. Breton yielded positive results. "The Native students are beginning to make themselves useful; eight having been already posted to corps, and four are about to be attached to two dispensaries, now forming for the relief of the suffering Natives...they will prove a highly useful class of public servants of the British Government in India." (*Oriental Herald*, 1826, Vol. X: 24) It was recorded in the realm of surgery too. A Mussalman (Mohmmedan) practitioner successfully did ophthalmologic surgeries (couching) on eleven patients. (Kirwan, 1937: 638-644) Furthermore, "*Case of Lithotomy, performed by a Native; communicated by A. K. Lindsay, Esq.*" was also described with due importance. (*Transactions of the Medical and Physical Society of Calcutta*, 1829, IV: 440-442)

Going against the stream, two points should be noted here. (1) As late as 1841, when Hospital of medicine of Indian variety was in full swing and acquisition of anatomical knowledge in medical education was set into motion, 'miasmic' theory of disease causation was also present along with pathological anatomy. "Of the various soils and situations productive of miasmata, the most deserving of notice, are low and

marshy place." (Annesley, 1841: 9) (2) There was distinct, sometimes nuanced too, chasm in the reception of Western medicine between the educated section and general population. In 1872 Buckland wrote to the Secretary, the Government of Bengal, "If any one has observed how difficult it is to get his private servants, or the people who come under his immediate influence of a sudden station to take English medicine properly and regularly, and to submit themselves to reasonable treatment, he will easily conceive how much of the effect is lost when medicine given to a set of ignorant and doubting people in the villages, who probably do their best to destroy the valuable of the English drugs by combining with them (as they fancy) the prescriptions of the kabirajes or the wise and aged women of the village." (*Proceedings of the Lieutenant-Governor of Bengal*, August 1872) Is it an act of subversion? Is it an enunciatory act of splitting that the colonial signifier creates? (Bhabha, 1998: 128)

Against this background, Āyurvedic practitioners began to be engaged in the process of modernizing Āyurveda. Major problems they faced were with (a) place of anatomical knowledge in Āyurveda, and (b) how to express old Āyurvedic terms in modern connotations. The second one was again related with the question of translation of one's language into other's one. Gyan Prakash asks, "At stake was the integrity of the Indian languages, which did not participate in the *creation* of modern scientific discourses but were *obliged* to incorporate them." (Praksh, 2000: 50) Further, "What were they to borrow and assimilate successfully without losing their fundamental character?" (Praksh, 2000: 50) Regarding this problem the Bengali magazine *Rahasya-Sandarbha* (An Anthology of Riddles) wrote, "When Bengali language is in incomplete form at present we are to collect abundant number of words from Sanskrit or other languages. It may quite help Bengali language in a considerable way." (Basu, 1998: 20) Leaving the question of translation apart for the time being let us come back to the question of Āyurveda as practiced in the 19th and early 20th century, at least, by the leading Āyurvedic practitioners.

To modernize Āyurveda various programmes were adopted. These may be listed thus – (1) formation of various societies for scientific and intellectual discourses, (2) publication of journals, (3) finding new terms in Sanskrit and Bengali equivalent to English medical terms, and (4) reinterpretation and standardization of classical texts of Āyurveda. The formation of societies and publication of journals

were in the shadow of the rising modern medical profession. In European context, formation of various societies and publication of journals were the two basic features of any professional group. In emulating this process Āyurvedics had to abandon the basic mode of traditional learning Āyurveda, i.e. *gurukul* system. Charles Trevelyan observed, "In the Sanskrit college of Calcutta, European anatomy and medicine have nearly supplanted the native systems." (Trevelyan, 1838: 8) The All India Ayurveda Mahasammelan was set up in 1907. "The movement which this organization represented sought to systematize the knowledge of Āyurvedic *clinical methods*, mainly by producing standard editions of classical and recent texts..." (Chatterjee, 1998: 278) In the pattern of European physicians, some of the Āyurvedic practitioners like Gangaprasad Sen introduced fixed consultation fees that equaled or surpassed the fees of British physicians. (Gupta, 1998: 373)

During the period 1918-1943, four Āyurvedic colleges and big hospitals were established. At the same period Dr. Popat Prabhuram and Vaidyaratna Gapalacharyulu established Āyurvedic colleges in Bombay and Madras respectively. Gananath Sen epitomized all these efforts, "...in 1835 the erudite scholar Madhusudan Gupta proceeded to dissect by his own hands. He first chanted the hymn of renaissance of Āyurveda. Since then, Āyurvedics have begun to firmly believe in the necessity of acquiring knowledge of anatomy." (Sen, 1944: 31) To attain 'clinical methods' the greatest emphasis was put on anatomical dissection. Suffice it to say, without the knowledge of anatomy no one can excel in surgery. Especially, to perform surgery in the treatment of ascites any surgeon at his will cannot do (jalodar roga). It demands knowledge and farsightedness." (Basu, 1998: 112) It was also suggested that what has been called *Viṣṇupadāmrita* in Āyurveda is nothing but oxygen. (Basu, 1998: 350)

In *Śārṅgadhara saṃhitā – nabhistha praṇapvanaḥ spriṣṭvā hṛtkamalāntaram / kaṇṭhād vahirviniryāti pātuṃ viṣṇupadāmṛtam //* (Pū. 5.43-44)

During nationalist revival, at least since 1885, *viṣṇupadāmṛtam* was translated to be *oxygen*. Nevertheless, in a different translation, "The breath of life located in the navel, touches the inside of the lotus of the heart, and then exits from the throat to the outside to drink the nectar of the sky (to my translation it would be 'the nectar of Viṣṇu')." (Wujastyk, 1998: 325) To a modern commentator, "Modern anatomists have never tried to count the exact number of Veins in human body, whereas Susruta

has given the precise number." (Thatte, 2005: 143) Always trying to search for modern connotations in ancient texts became more entrenched through 'modern' Āyurvedic pictures following colonial encounter in anatomy.

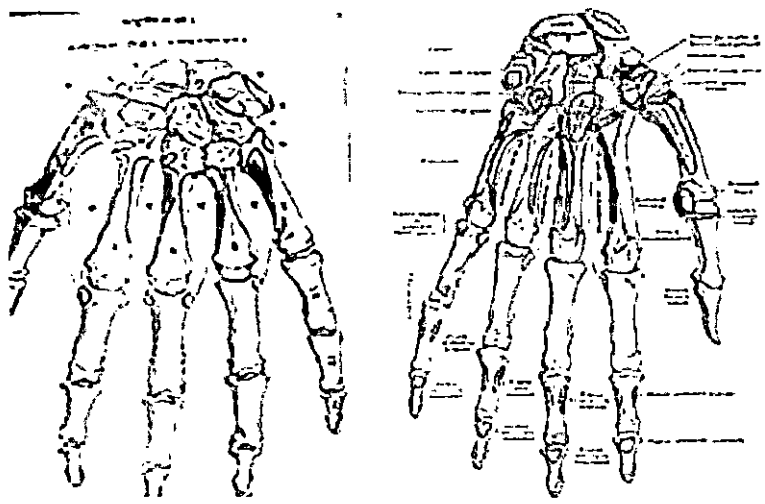


Fig. 16 [Picture on left is taken from *Āyurveda Saṃgraha (pariśiṣṭa)*, revised by Kaviraj Devendranath Sengupta and Kaviraj Upendranath Sengupta (Calcutta: C. K. Sen, 1902), 18. The next picture is from *Gray's Anatomy*, 1887. T. Pickering Pick was the editor of this edition and colour printing was introduced for the first time.]

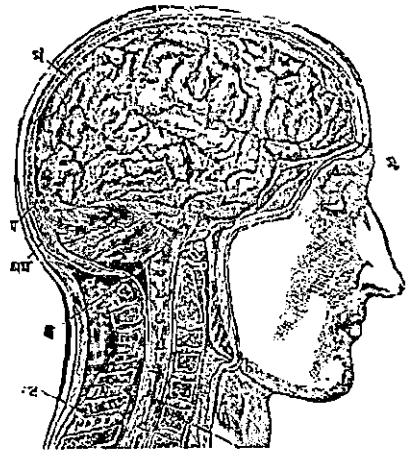


Fig. 17a

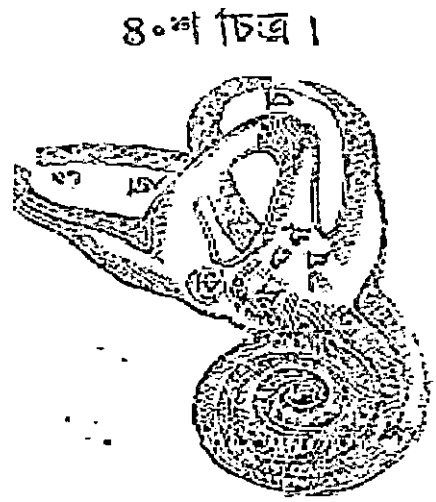


Fig. 17b [Picture above is again from *Āyurveda Saṃgraha (pariśiṣṭa)*, p.64. The picture below is also from the same book, p.88. In the first picture internal details of the brain, which was a completely unexplored area in classical Āyurveda, are illustrated. In the second one, authors dare to give accurate details of the internal ear that is solely inconceivable in the classical texts. In Āyurveda, position and function of *hṛdaya* (not the post-Harverian heart as discussed before) is undefined, more so of the brain, and better not to speak of the internal ear, inconceivable to the wildest guess of the ancient healers.]

Such was the trope of epistemological reconstitution of terms and, consequently, knowledge to make it consistent with positivist colonial scientific logic and reasoning. Printing technology rendered manuscript culture of pre-colonial India marginal. There were both 'mimicry' and 'hybridization' within 'modern' Āyurveda. As a result of such contestations between Western and indigenous medicines there emerged a space split open – the all-powerful Western therapeutics and indigenous ontology of health. Contesting, yet vanquished, indigenous population and practitioners tried to inscribe their presence inside this space – oftentimes as 'mimicry', more often through rejection of Western medicine – and resorting to indigenous healing practices, particularly in case of chronic diseases (which is till date a dark area of modern medicine). Eminent physician and Āyurvedic Girindranath Mukhopadhyaya advocated for anatomical dissection, hospital setting and institutionalization of entire Āyurvedic system. (Mukhopadhyaya, 1974, Vol. II)

As discussed earlier about the effect of Brahminization on Āyurveda, Manu mentions physicians in the same category as meat-sellers or liquor-vendors, and Yājñavalkya classes them with thieves, prostitutes and others, whose food cannot be taken. (Basu, 1894: 20) Western medical practice provided the way to rise over the social stigma of physicians inscribed on them by the Brahminic society. But they had to pay for it. Subjectivity of the rising and modern Indian physicians was reconstituted. They began to perceive both the body and health in the light of post-enlightenment Europe. 'Indianity' was to be fought with modernity. Within the interstices of modern health perception and treatment of diseases a space was split open through insinuation of Indian ontology of health and 'Indianness' of the body.

Perhaps on the skeleton of Indian medical knowledge the robust body of modern medicine was constructed.

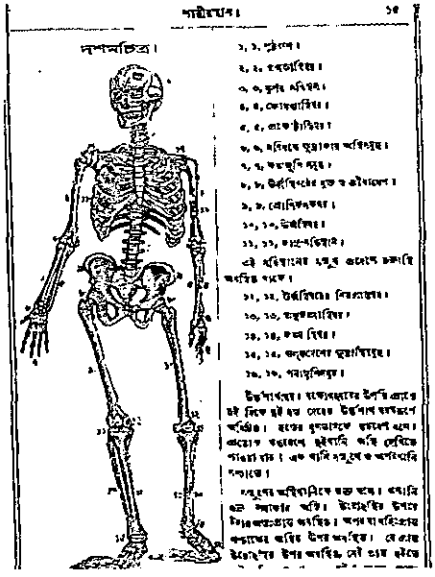


Fig. 18

In another more learned writing, "Vāgbhaṭa (2nd Century B. C – Kunte), for instance, displays his knowledge of bacteria..." (Sharma, 1929: 195) The author also finds example of modern medical conceptions like endocrinology in Āyurveda, "Hindu physicians classify disease from the view-point of the 'soil' which is the same as sympathetic Endocrinology..."(Sharma, 1929: 189) One more learned author analyzes, "The classification of dravyas under fivefold *bhūta* group is based upon certain *physico-chemical* properties or qualities ascribed to each *bhūta* class." (Dash,

1971: 72-73) Examples of similar nature will go on accruing. It is better to recollect Partha Chatterjee here, "given the close proximity between modern knowledge and modern regimes of power, we would for ever remain consumers of universal modernity; never would be taken seriously as its producers." (Chatterjee, 1998: 275)

It was the fundamental crisis which was faced by Āyurvedic practitioners. They were always in fear of losing their selves. To reconstitute their selves in the dislocating milieu of colonialism they took recourse to various tropes discussed above. But in doing so they were perhaps perpetually entrapped in a number of problems – (a) epistemological dislocation of Āyurvedic concepts, (b) unwittingly hailing the superiority of modern anatomical and surgical knowledge, (c) extermination of basic knowledge system of Āyurveda and indigenous world, and, finally, (d) reconstitution of their own selves in the language of Modernity. They became 'modern' medical practitioner in the garb of Āyurveda and doing different sort of practice, so called 'alternative medicine'. This modernizing spree went even to the extent of judging the question of childhood-marriage from modern anatomical knowledge of ossification of bones. (Basu, 1998: 166-187) In one self-critical note, it became evident "Despite the fact that Hindu Ayurveda has attained the final limit of excellence Western physicians has improved their medicine to an incredible level. They have endeavor, industriousness, and research. We do not have anything except pride and self-conceit." (Basu, 1998: 115) David Arnold comments, "From the 1890s there was a revival of the indigenous systems, with the establishment of Ayurvedic and Unani colleges and dispensaries and the manufacture of drugs along western lines, which aimed to put the 'traditional' systems on a par professionally and commercially with the allopathic interloper." (Arnold, 1996)

A few years back, Anirban Das insightfully showed how modern medical has insidiously reconstituted the concept of the body in Ayurveda. With professionalization and the concomitant institutionalization and state patronage, Ayurveda translates its knowledge of the body into categories of modern medicine. Even in the "shuddha" institutions, separating the two systems in pedagogy, the conceptualization of the anatomy of the "body" brings in the three-dimensional space of anatomo-clinical knowledge where diseases are expressed." (Das, 2001: 126) This basic tension and 'war of attrition' was conceived by the Āyurvedics, especially, of

the twentieth century. Gananath Sen used to tell in a lighter vein to his students about the present state of Āyurvedic knowledge –

Mālākāścakarmakārah nāpito rajakastatha /

Bṛddhāḍandā biśeṣaṃa balāu panca cikitsakā // [In the age of Kali or *kali yuga* there are five physicians – garland maker, blacksmith, barber, washer man and old widow (in slang).] (Tahkur, 1994: 1)

No other expression can possibly express so succinctly both epistemological and ontological characteristics of 'modern' Āyurveda that finally became an Indianized replica of modern Western medicine. Excepting the states of Kerala, Tamilnadu and part of Maharashtra all other states are following this dictum of 'modern' Āyurveda set into motion by Āyurvedic practitioners like Gananath Sen, Upendranath Sen, Gangadhara Kaviraj, Shiv Sharma, P. S. Varier (Varrier, 2005) and others. For example, Varrier's book is declared as a "concise and complete text book of human anatomy and physiology in Sanskrit with commentary and illustrations compiled for the use of āyurveda colleges." It was first published in 1925. All the diagrams and illustrations are taken from standard textbooks of modern anatomy. The same type of illustrations we have seen in the works of Gananath Sen and Upendranath Sen too.

This dictum of Āyurveda is carried forward in modern day health practices too. The pictures shown above are some exemplars of this trend, where both 'mimicry' and 'hybridization' of 'modern' Āyurveda are figuratively represented.

This dissertation is a humble attempt to address all these complicated, multi-layered and interrelated issues along with the study of encounter between two medical knowledge systems where the question of bodily dissection played the central and epoch-making role.

Bibliography

Abernethy, John. October 1827. *The Dissector, or Manual of Anatomy*: 25-26.

Abernethy, J. 1814. *An Enquiry into the Probability and Rationality of Mr. Hunter's Theory of Life; Being the Subject of the First Two Anatomical Lectures Delivered before the Royal College of Surgeons, of London.* London: Longman, Hurst, Rees.

Achar, B. N. Narahari. 1998. On the meaning of AV XIX.53.3: Measurement of Time? *Electronic Journal of Vedic Studies* 4 (2): 21-26. Reference: http://www.ejvs.laurasianacademy.com/ejvs0402/ejvs0402article.pdf. Accessed May 27 2005.

Achar, B. N. Narahari. 1997. A Note on the Five-Year Yuga of the Vedāṅga Jyotiṣa. *Electronic Journal of Vedic Studies* 3 (4): 21-28. Reference: http://www.ejvs.laurasianacademy.com/ejvs0402/ejvs0402article.pdf. Accessed May 27 2005.

Acharya, Poromesh. 1994. Pedagogy and Social Learning: *Tol* and *Pāṭhśāla* in Bengal. *Studies in History* 10 (2): 255-272.

Achārya. Jadavji Trikamji, ed. 2008. *Suśrutasaṃhitā of Suśruta with the Nibandhasaṅgraha Commentary of Sri Dalhanāchārya.* Varanasi: Chaukhamba Surbharati Prakashan.

Ackerknecht, Erwin.1958. Historical Notes on Cancer. *Medical History* 2: 114-19.

Ackernecht, Erwin. 1967. *Medicine at the Paris Hospital 1794-1848.* Baltimore, Maryland: The Johns Hopkins University Press.

Adam, William. *Third Report on the State of Education in Bengal including Some Account of the State of Education in Behar.* Calcutta: Military Orphan Pres, 1838.

Adams, Francis, trans. 1819. *The Genuine Works of Hippocrates*, Vol. II. London: Sydenham Society.

Ainslie, W. 1813. *Materia medica of Hindoostan and artisan's and agriculturist's nomenclature.* Calcutta: Government Press.

Ainslie, W. 1826. *Materia indica or, some account of those articles which are employed by the Hindus, and other eastern nations, in their medicine, arts, and agriculture*, Vol. I & II. London: Longman, Rees, Orme, Brown, and Green.

Aitareya Brāhmaṇa.

Alborn, Timothy L. 1999. Age and Empire in the Indian Census, 1871-1931. *Journal of Interdisciplinary History* 30 (1): 61-89.

Altekar, A. S. 1944. *Education in Ancient India.* Benares: Nandkishore and Bros.

Alter, Joseph S. 2000. *Gandhi's Body: Sex, Diet and the Politics of Nationalism.* Philadelphia: The University of Pennsylvania Press, 2000.

Anderson, Benedict. 1995. *Imagined Communities: Reflections on the Origin and Spread of Nationalism.* London, New York: Verso.

Annesley, James. 1841. *Researches into the causes, nature, and treatment of the most prevalent diseases of India and of warm climates generally.* London: Longman, Brown, Green, and Longmans.

Anonymous. Liberality of the Indian Government towards the Native Medical Institution of Bengal. *The Oriental Herald and Journal of General Literature*, Vol. X, July to September 1826, 17-25. London: Gordon, and Co and Lion Court, 1826.

Anonymous. 1935. Reflections of the Calcutta Medical College Forty-Five Years Ago. In *Centenary Volume*, 154-161. Calcutta: Medical College Centenary Volume Committee.

Apte, Vaman Shivram. 1985. The Practical Sanskrit-English Dictionary. Delhi: Motilal Banarsidass.

Armstrong, David. 1985. The subject and the social in medicine: an appreciation of Michael Foucault. *Sociology of Health and Illness* 7 (1): 108-117.

Armstrong, David. 1993. Public health space and the fabrication of identity. *Sociology* 27 (3): 393-410.

Armstrong, David. 1999. Bodies of Knowledge/Knowledge of Bodies. In *Reassessing Foucault: Power, Medicine and the Body*, ed. C. Jones and R. Porter, 17-27. London and New York: Routledge.

Arnold, David. 1985. Medical Priorities and Practices in Nineteenth-Century British India. *South Asia Research* 5: 167-183

Arnold, David. 1988. Introduction: disease, medicine and empire. In *Imperial Medicine and indigenous Societies*, ed. David Arnold, 1-26. New Delhi: Oxford University Press.

Arnold, David. 1995. *Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India.* New Delhi: Oxford University Press.

Arnold, David. 1996. The rise of western medicine in India. *Lancet* 348 (9034): 1075-1078.

Arnold, David. 2004. Race, place and bodily difference in early nineteenth-century India. *Historical Research* 77 (196): 254-273.

Arnold, David. 2005. Europe, Technology and Colonialism in the 20th Century. *History and Technology* 21: 85-106.

Arnold, David and Hecht, Gabrielle. 2004. *Colonialism, Decolonization, and Development Analytic Themes, Research Programmatics, and Collaborative Projects.* Reference: www.histech.nl/tensphase2/Publications/Working/ArnoldHecht.pdf. Accessed 12 April 2008.

Aronowitz, Robert A. 1998. *Making Sense of Illness: Science, Society, and Disease.* Cambridge: Cambridge University Press.

Asiatic Journal and Monthly Register for British India and its Dependencies 1829, 28.

Baber, Zaher. 1998. *The Science and Empire: Scientific Knowledge, Civilization, and Colonial Rule in India.* New Delhi: Oxford University Press.

Bala, Poonam. 1991. *Imperialism and Medicine in Bengal: A Socio-historical Perspective.* New Delhi, London: Sage Publications.

Ballantyne, James R. 1859. *Christianity contrasted with Hindu philosophy: an essay in five books, Sanskrit and English: with practical suggestions tendered to the missionary among the Hindus.* London: James Madden.

Bandyopaddhyaya, Brajendrnath Nath, ed. and compiled. 1994. *Sangbadpatre Sekaler Katha (Stories of Olden Days in Newspaper).* Calcutta: Bangiya Sahitya Parishad.

Banerjee, Gauranga Nath. 1920. *Hellenism in Ancient India.* Calcutta: Butterworth & Co.

Basham, A. L. 1998. The Practice of Medicine in Ancient and Medieval India. In *Ancient Medical Systems: A Comparative Study*, ed. Charles Leslie, 18-43. Delhi: Motilal Banarsidass.

Basu, Pradip, ed. 1998. *Samayiki* [Periodicals on Current Events]. Calcutta: Ananda Publishers Private Limited.

Bose, Pramatha Nath. 1894. *A History of Hindu Civilization during British Rule.* Calcutta: W. Newman & Co.

Bay, B H. and Ling, E A. 2007. Teaching of Anatomy in the millennium. *Singapore Medical Journal* 48 (3): 182-183.

Bayly, C. A. 1994. British Orientalism and the Indian 'Rational Tradition' c. 1780-1820. *South Asia Research*, 14 (1): 1-9.

Beal, Samuel, trans. 1884. *Si-Yu-Ki (Buddhist Records of the Western World*, Vol. I & II. London: Trubner & Co.

Beclard, P. A. 1823. *Additions to the General Anatomy of Xavier Bichat*, trans. George Hayward. Boston: Richardson and Lord.

Bedroe, Edward. 1893. *The Origin and Growth of the Healing Art: A Popular History of Medicine in All Ages and Countries*. London: Swan Sonnenschen & Co.

Benner, Dagmar. 2009. *Saṃskāras* in Vagbhaṭa's *Aṣṭāṅgahṛdayasaṃhitā: garbhādhāna, ṛtusaṃgamana, puṃsavana*. In *Mathematics and Medicine in Sanskrit*, ed. Dominik Wujastyk, 119-133. Delhi: Motilal Banarsidass.

Bernier, Francois. 1916. *Travels in the Mughal Empire (A.D. 1656-1668)*, trans. A. Constable. London: Oxford University Press.

Bewell, Allan. 1999. *Romanticism and Colonial Disease*. Baltimore, London: The Johns Hopkins University Press.

Bhabha, Homi K. 1998. *The Location of Culture*. London, New York: Routledge.

Bhattacharya, Jayanta. 2004. The Body: Epistemological Encounter in Anatomy. In *Making Sense of Health, Illness and Disease*, ed. Peter L. Twohig and Vera Kalitzkas, 31-53. Amsterdam, New York: Rodopi.

Bhattacharya, Jayanta. 2008. Encounter in Anatomical Knowledge: East and West. *Indian Journal of History of Science* 43 (2): 163–209.

Bhattacharya, Jayanta. 2009. The Knowledge of Anatomy and Health in Āyurveda and Modern Medicine: Colonial Confrontation and Its Outcome. *Eä - Revista de humanidades médicas & estudios sociales de la ciencia y la tecnologia* 1:1-51.

Bhattacharya, Sanjay, Mark Harrison and Michael Worboys. 2005. *Fractured States: Small Pox, Public Health and Vaccination Policy in British India, 1800-1947*. Delhi: Orient Longman.

Bhattacharya, Vijaykali. 2001. Āyurveder itihas (history of Āyurveda). In *Āyurveda Sankalan: 1 (Collection of Āyurveda)*, ed. Kalish Chandra Kaviratna, 1-79. Kolkata: Dipayan.

Bhishagratna, Kunjlal, trans. 1963. *The Sushruta Samhita*, Vol. I, II & III. Varanasi: The Chowkhamba Sanskrit Series Office.

Bird, J. 1829. Case of Ischuria Renalis. *Transactions of the Medical and Physical Society of Calcutta* IV: 21-27.

B. L. 1794. Curious Chirurgical Operation. *Gentleman's Magazine and Historical Chronicle for the Year MDCCXCIV* Vol. 64, Part 2: 891.

Bloomfield, Maurice. 1897. *Hymns of Atharva-veda, together with extracts from the ritual books and the commentaries*. Oxford: Clarendon Press.

Bokil, V. P. 1925. *The History of Education in Ancient India*, Part I (Aryan Period). Bombay: Nand Kishore and Bros.

Booth, C. C. 1979. The development of clinical science in Britain. *British Medical Journal* 1: 1469-1473.

Bose, Pramatha Nath. 1894. *A History of Hindu Civilization during British Rule*. Calcutta: W. Newman & Co.

Boyd, Kenneth M. 2000. Disease, illness, sickness, health and healing: some elusive concepts. *Medical Humanities* 26: 8-17.

Brenner, M. J. 2000. Looking Back on the Millennium in Medicine. *New England Journal of Medicine* 342: 42-49.

Breton, Peter. 1825. *A Vocabulary of the Names of the Various Parts of the Human Body and of Medical and Technical Terms in English, Arabic, Persian, Hindee and Sanscrit, for the Use of the Members of the Medical Department in India*. Calcutta: Government Lithographic Press.

Breton, Peter. July to September 1826. Liberality of the Indian Government towards the Native Medical Institution of Bengal. *The Oriental Herald and Journal of General Literature*, Vol. X: 17-25. London: Gordon, and Co and Lion Court.

Brown, John. 1866. *Locke and Sydenham*. Edinburgh: Edmonson and Douglas.

Bruns, Prudence. 2004. Philosophical Influence in Indian Medicine. *Sagar. A South Asia Graduate Research Journal* 13: 53-68

Buckland, Charles E. 1901. *Bengal under the Lieutenant Governors*, Vol. I. Calcutta: S. K. Lahiri & Co.

Butalia, Urvashi. 1993. English textbook, Indian publisher. *Media, Culture and Society* 15: 217-232

Calcutta Gazette. 14 September, 1797.

Calcutta Gazette. 15 September, 1796.

Calcutta Gazette. 24 September, 1795.

Calcutta Monthly Journal and General Register of Occurrences. For the year 1836. 1837. Calcutta: Samuel Smith and Co.

Canguilhem, Georges. 1978. *On the Normal and the Pathological*. Dordrecht: D. Reidel Publishing Co.

Caraka Saṃhitā. trans. and ed. Kaviraj Brajendra Chandra Nag. Vol. II. 1994. Calcutta: Nabapatra Prakashana.

Cardona, George 1991. A Path Still Taken: Some Early Indian Arguments concerning Time. *Journal of the American Oriental Society* 111 (3): 445-464.

Carey, William. 1818. *A Grammar of the Bengalee Language*, 4th edition. Serampore: Mission Press.

Carpue, Joseph Cconstantine. 1816. *An account of two successful operations for restoring a lost nose from the integuments of the forehead, in the cases of two officers of his majesty's army: to which are prefixed, historical and physiological remarks on the nasal operation; including descriptions of the Indian and Italian methods*. London: Longman, Hurst, Rees, Orme and Brown.

Casper, J. L. 1861. *Handbook of Forensic Medicine, based upon personal experience*, trans. George William Balfour, Vol. II. London: New Sydenham Society.

Chakrabarty, Dipesh. 2001. *Provincializing Europe: Postcolonial Thought and Historical Differences*. New Delhi: Oxford University Press.

Chakrabarti, Pratik. 2004. *Western Science in Modern India: Metropolitan Methods, Colonial Practices*. New Delhi: permanent black.

Chakaraberty, Chandra. 1923. *An Interpretation of Ancient Hindu Medicine*. Calcutta: Ramchandra Chakraberty.

Chatterjee, Partha. 1986. *Nationalist Thought and the Colonial World: A Derivative Discourse?* London: Zed Books.

Chatterjee, Partha. 1996. The Disciplines in Colonial Bengal. In *Texts of Power: Emerging Disciplines in Colonial Bengal*, ed. Partha Chatterjee, 1-29. Calcutta: Samya.

Chatterjee, Partha. 1998. Talking about our Modernity in Two Languages. In *A Possible India – Essays in Political Criticism*, 263-285. New Delhi: Oxford University Press, 1998.

Chatterjee, Partha. 2001. The nation in heterogeneous time. *Indian Economic and Social History Review* 38 (4): 399-418.

Chattopaddhyaya, Debiprasad. 1977. *Science and Society in Ancient India.* Calcutta: Research India Publications.

Chevalier, Thomas. 1797. *Observations in defence of a bill brought lately into parliament for erecting the Corporation of Surgeons of London into a College and for granting and confirming to such colleges certain rights and privileges: including a sketch of the history of surgery in England.* London: J. Johnston & J. Debreth.

Chobanian, Aram V. 27 August 2009. (Shattuck Lecture) The Hypertension Paradox – More Uncontrolled Disease despite Improved Therapy. *New England Journal of Medicine* 361: 878-887.

Cohn, Bernard S. 2004. *Colonialism and its Forms of Knowledge: The British India* (included in *The Bernard Cohn Omnibus*). New Delhi: Oxford University Press.

Comba. Antonella. 2001. Carakasaṃhitā. Śārīrasthāna I and Vaiśeṣika philosophy. In *Studies on Indian Medical History*, ed. G. Jan Meuelenbeld and Dominik Wujastyk, 3955. Delhi: Motilal Banarsidass.

Crawford, D. G. 1914. *History of Indian Medical Service*, Vol. II. London: W. Thacker & Co.

Cregan. Kate. 2007. Early Modern Anatomy and the Queen's Body Natural: The Sovereign Subject. *Body & Society* 13 (2): 47-66.

Culler, Jonathan. 1981. *The Pursuit of Signs*. London: Routledge.

Cunningham, Andrew. 1975. The Kinds of Anatomy. *Medical History* 19: 1-19.

Cunningham, Andrew. 2002. Identifying Disease in the Past: Cutting the Gordian knot. *Asclepio* 54: 13-34.

Das, Anirban. 2001. Medical Knowledge of the Body: Colonial Encounters. *Rethinking Marxism* 13 (2): 109-131.

Das, Rahul Peter. 1983. More on the Dissection of Cadavers in Ancient India. *Ancient Science of Life* 3 (1): 48.

Das, R. P. 2001. On the identification of a Vedic plant. In *Studiès on Indian Medical History*, ed. G. Jan Meulenbeld and Dominik Wujastyk, 17-38. Delhi: Motilal Banarsidass.

Das, Rahul P. 2003a. *The Origin of the Life of a Human Being: Conception and the Female According to Ancient Indian Medical and Sexological Literature*. Delhi: Motilal Banarsidass.

Das, Rahul P. 2003b. The Develpoment of Traditional South Asian Medicine against the Background of the 'Magical' Mode of Looking at the World. *Traditional South Asian Medicine* 7: 29-54.

Dasgupta, Surendra Nath. 1991. *A History of Indian Philosophy*, Vol. II. Delhi: Motilal Banarsidass.

Dash, Bhagwan. 1971. *Concept of Agni in Āyurveda with Special Reference to Agnibla Parikṣā*. Varanasi: Chowkhamba Sanskrit Series Office.

Davis, Lennard J. 1995. *Enforcing normalcy: disability, deafness, and the body*. New York: Verso.

Deb, Binay Krishna. 1977. *The Early History and Growth of Calcutta, . Calcutta*. Calcutta: Rddhi.

Derbes, V. J & Mitchell, Jr., R. E. 1955. Hermann Boerhaave's (*1*) *Atrocis, nec Descripti Prius, Morbi Historia* (*2*) The First Translation of the Classic Case Report of Rupture of the Esophagus, with Annotations. *Bulletin of Medical Library Association* 43 (2): 217–240.

Devi, N and V. Kishore, trans. *Rāmāyaṇa*, V.28.6. Retrieved 24 July 2008, from www.valmikiramayan.net. Also see, Goldman, R. P. & Goldman, S. J. S. 1996. *The Ramayana of Valmiki*, Vol. V. Princeton, NJ: Princeton University Press.

Dey, Kanailal. 1896. *Indigenous Drugs of India: Short Descriptive Notices of the Principal Medicinal Products met with in British India*. Calcutta: Thacker, Spink & Co.

Di Bona, Joseph E. 1981. Indigenous Virtue and Foreign Vice: Alternative Perspectives on Colonial Education. *Comparative Education Review* 5 (2): 202-215.

Dodson, Michael. 2005. Translating Science, Translating Empire: The Power of Language in Colonial North India. *Comparative Study of Society and History* 47 (4): 809-835.

Doyle, Julie. 2008. The Spectre of the Scalpel: The Historical role of Surgery and Anatomy in Conceptions of Embodiment. *Body & Society* 14 (1): 9-30.

Duffin, Jacalyn. 1999. Laennec and Broussais: The 'Sympathetic' Duel. In *Constructing Paris Medicine*, ed. C. Hannaway and A. La Berge, Clio Medica/The Wellcome Series in the History of Medicine, 251-274. Amsterdam/Atlanta, GA: Rodopi.

Dutt, Manmatha Nath, ed. 1906. *Harīta Saṃhitā*. Calcutta: Elysium Press.

Dutt, Uday Chand. 1922. *The Materia Medica of the Hindus; with a glossary of Indian plants by George King*. Calcutta: Adi-Ayurveda Machine Press.

Dyer, G. S. M. and M. E. L. Thorndike. 2000. Quidne Mortui Vivos Docent? Human Dissection in Medical Education. *Academic Medicine* 75 (10): 969-79.

Edelstein, Ludwig. 1987. *Ancient Medicine*. Oswei Temkin and C. Lilian Temkin, ed. Baltimore and London: The Johns Hopkins University Press.

Edinburgh Medical and Surgical Journal: A Concise View of the Latest and Most Important Discoveries in Medicine, Surgery, and Pharmacy 26 (1826). London, Dublin: Longman, Rees, Orme, Btown, Green and John Cumming.

Edinburgh Medical and Surgical Journal 46 (1836): 1-38. Report of the Cases treated during the Course of Clinical Lectures delivered at the Royal Infirmary in the Session 1834-1835.

Eggeling, Julius, ed. 1897. *Satapatha-brahmana, according to the text of the Madhyandina school*, Part IV (Books VII, IX and X). Oxford: Clarendon Press. Also, see, Eggeling, Julius, ed. 1900. *Satapatha Brahmana Part V (SBE44)*. URL: www.sacred-texts.com.

Elliott, J. R. 1957. The development of cotton wool as a wound dressing. *Medical History* 1 (4): 362-366.

Emmerick, Ronald Eric. 1993. The Indo-Iranian Concept of Disease and Cure. *Journal of European Āyurvedic Society* 3: 72-93.

Emmott, D. H. 1965. Alexander Duff and the Foundation of Modern Education in India. *British Journal of Educational Studies* 13 (2): 160-169.

Engel, George F. 1977. The Need for a New Medical Model: A Challenge for Biomedicine. *Science* 196 (4236): 129-136.

Engler, Steven. 2003. Science vs. Religion in Classical Ayurveda. *Numen* 50: 416-463.

Ess, Charles. 2000. The Relation between Sanskrit and Indian Conceptions of Time. Ref: www.postcolonialweb.org/india/philosophy/phil1.html. Accessed June 15 2004.

Ewing, Arthur H. 1901. The Hindu Conception of the Functions of Breath, - A Study in Early Hindu Psycho-Physics. *Journal of the American Oriental Society* 22: 249-308.

Fabrega Jr., Horacio. 2009. *History of Mental Illness in India: A Cultural Psychiatry Retrospective*. Delhi: Motilal Banarsidass.

Emmerick, R. E. 1993. Indo-Iranian Concepts of Disease and Cure. *Journal of European Āyurvedic Society* 3: 72-93.

Fabrega, Horacio Jr. 2009. *History of Mental Illness in India: A Cultural Psychiatry Retrospective*. Delhi: Motilal Banarsidass.

Felts, John H. 2000. Richard Lower: Anatomist and Physiologist. *Annals of Internal Medicine* 132 (5): 420-423.

Filliozat, J. 1964. *The Classical Doctrine of Indian Medicine: Its Origins and its Greek Parallels*. New Delhi: Munshiram Manoharlal.

Fischer-Homberger, Esther. 1970. Eighteenth-Century Nosology and its Survivors. *Medical History* 14 (4): 397-403.

Fiser I and O. Fiserova. 1963. Dissection in Ancient India. In *History and Culture of Ancient India (For the XXVI International Congress of Orientalists)*, ed. W. Ruben, V. Struve and G. Bongard-Levin, 306-328. Moscow: Oriental Literature Publishing House.

Forbes, Geraldine. 1999. *Positivism in Bengal*. Calcutta: Papyrus.

Forbes, James. 1813. *Oriental Memoirs*, Vol. I, II & III. London: White, Cochrane & Co.

Foster, W. D. 1959. The Early History of Clinical Pathology in Great Britain. *Medical History* 3: 173-187.

Foucault, Michel. 1994. *The Birth of the Clinic: Archaeology of Medical Perception*. New York: Vintage Books.

Francis, Charles R. 1868. A Course of Lectures on the Principles and Practice of Medicine, delivered at the Medical College of Bengal. *The Indian Medical Gazette, A Monthly Record of Medicine, Surgery, Obstetrics, Jurisprudence, and the Collateral Sciences; and of General Medical Intelligence, Indian and European* 3: 99- 101.

Fredriksen, S. 2002. Diseases are invisible. *Journal of Medical Ethics* 28 (2): 71-73

French, Roger K. 1978. The thorax in history 1. From ancient times to Aristotle. *Thorax* 33: 10-18.

French, Roger K. 1978. The thorax in history. 4. Human dissection and anatomical progress. *Thorax* 33 (4): 439-456.

French, Roger. 1993. The Anatomical Tradition. In *Companion Encyclopedia of the History of Medicine*, Vol. II, ed. W. F. Bynum and Roy Porter, 81-101. London and New York: Routledge.

Fryer, John. 1912. *A New Account of East India and Persia Being Nine Years' Travels 1672-1681*, edited by William Crooke, Vol. I, II & III. London: The Hakluyt Society.

Getz, Faye Marie. 1982. Gilbertus Anglicus Anglicized. *Medical History* 26: 436-442.

Ghosh, Suresh Chandra. 2001. *The History of Education in Medieval India 1192 A.D. – 1757 A.D.* Delhi: Originals.

General Committee of the Fever Hospital and Municipal Improvements, Appendix D-F, Vol. 7, 1836-1838. 1838. Calcutta: G. H. Lyttman, Military Orphan Press. (West Bengal State Archives)

Gentleman's Magazine and Historical Chronicle for the Year MDCCXCIV 64, Part 2 (1794): 891-892.

Getz, Faye Marie. 1982. Gilbertus Anglicus Anglicized. *Medical History* 26: 436-442.

Gibson, Mary E. 1983. The Idntification of Kala Azar and the Discovery of *Leishmania Donovani*. *Medical History* 27: 203-213.

Gorman, Mel. 1988. Introduction of Western science into Colonial India: role of the Calcutta Medical College. *Proceedings of the American Philosophical Society* 132 (3): 276-298.

Graaf, Robert C. van de. 2009. Some remarks on the revival of rhinoplasty in Europe in the early nineteenth century. *Acta Ornitholaryngologica Italica* 29: 226-227.

Graves, Professor. 1837. Lecture II. *The London Medical Gazette Being A Weekly Journal of Medicine and the Collateral Sciences* XIX: 521-526.

Gray's Anatomy, 38th edn. 1995. Edited by PL Williams, LH Bannister, MM Berry, P Collins, M Dyson, JE Dussek and MWJ Ferguson. Edinburgh, London: Churchill Livingstone.

Groopman, Jerome. 2004. A Great Case. *New England Journal of Medicine* 351: 243-245.

Guerrini, Anita. 1987. Archibald Pitcraine and Newtonian Medicine. *Medical History* 31: 70-83.

Gupta, Brahmananda. 1998. Indigenous Medicine in Nineteenth- and Twentieth-Century Bengal. In *Asian Medical Systems: A Comparative Study*, edited by Charles Leslie, 368-382. Delhi: Motilal Banarsidass.

Guttmann, Geoffrey D, Drake, Richard Lee and Trelease, Robert B. 2004. To What Extent Is Cadaveric Dissection Necessary to Learn Medical Gross Anatomy? A Debate Forum. *The Anatomical Record (Part B: New Anatomy)* 281B: 2-3.

Halhed, Nathaniel Brassey, trans. 1776. *A Code of Gentoo Laws, or Ordinations of the pundits, from a Persian Translation, Made from the Original, Written in Shanscrit Language*. London: [s. n].

Hall, William J. 2000. The Doctors of Time. *Annals of Internal Medicine* 132: 18-24.

Hancock, Philip, Bill Hughes, Elizabeth Jagger, Kevin Patterson, Rachel Russell, Emmanuelle Tulle-Winton, and Melissa Tyler. 2000. *The Body, Culture and Society: An Introduction*. Buckingham: Open University Press.

Hannaway, Caroline and Anne La Berge, ed. 1999. *Constructing Paris Medicine*. Amsterdam, Atlanta, GA: Rodopi.

Harrison, Mark. 1994. *Public Health in British India: Anglo-Indian preventive medicine 1859-1914*. Cambridge: Cambridge University Press.

Harrison's Principles of Internal Medicine, 17th edn. 2008. Ed. Anthony S. Fauci, Eugene Braunwald, Dennis L. Kasper, Stephen L. Hauser, Dan L. Longo, J. Larry Jameson and Joseph Loscalzo. New York: The McGraw-Hill Companies, Inc.

Handerson, Henry E. 1918. *Gilbertus Anglicus: Medicine of the Thirteenth Century*. Cleveland, Ohio: The Cleveland Medical Library Association.

Harrison, Mark. 1996. "The Tender Frame of Man": Disease, Climate, and Racial Difference in India and the West Indies, 1760-1860. *Bulletin of the History of Medicine* 70: 68-93.

Harrison, Mark. 1999. *Climates and Constitutions: Health, Race, Environment and British Imperialism in India 1600-1850.* New Delhi: Oxford University Press.

Harrison, Mark. 2005. Science and the British Empire. *Isis* 96: 56-63

Harrison, Mark. 2006. Medicine and Orientalism: Perspectives on Europe's Encounter with Indian Medical Systems. In *Health, Medicine and Empire: Perspectives on Colonial India,* ed. Mark Harrison and Biswamay Pati, 37-87. New Delhi: Orient Longman.

Hatcher, Brian A. 2007. Sanskrit and the morning after: The metaphorics and theory of intellectual change. *Indian Economic Social History Review* 44 (3): 333-61.

Headrick, Daniel. 1981. *The Tools of Empire: Technology and Imperialism in Nineteenth Century.* New York, Oxford: Oxford University Press.

Heaton, Charles. 1897. *Medical Hints for Hot Climates and for Those out of Reach of Professional Aid.* London: W. Thacker & Co.

Heaton, Janet. 2001. Hospital Discharge and the Temporal Regulation of Bodies. *Time & Society* 10 (1): 93-111.

Henderson, Thomas. 1829. *An Epitome of the Physiology, General Anatomy and Pathology by Bichat.* Philadelphia: Carey, Lea & Carey.

Henry, William. 1811. Experiments on the Urine Discharged in Diabetes Mellitus with Remarks on that Disease. *Medico- Chirurgical Transactions* 2 (1811): 119-136.

Hochmuth, Christian. 2006. Patterns of Medical Culture in Colonial Bengal, 1835-1880. *Bulletin of the History of Medicine* 80: 39-72.

Hoernle, A. F. R. 1994 (original print in 1907). *Studies in the Medicine of Ancient India.* New Delhi: Concept Publishing House.

Hooper, Robert. 1802. *The Anatomist's Vade-Mecum. Containing the Anatomy, Physiology, Morbid Appearances &c of the Human Body,* 4th edn. London: Murray and Highley.

Horstmanshoff, H.F.J. 1995. Galen and his patients. In *Ancient Medicine in its Socio-Cultural Context,* ed. Ph.J. van der Eijk, H.F.J. Horstmanshoff and P.H. Schrijvers, 83-99. Amsterdam, Atlanta, G A.

Houben, Jan E. M. 2002. The Brahmin Intellectual. *Journal of Indian Philosophy* 30: 463-479.

Houben, Jan E. M. 2007. Cakrapāṇi-Dāsa's Abhinavacintāmaṇi: early modern or post-classical Āyurveda? *Electronic Journal of Indian Medicine* 1: 63-88. Reference: journals.indianmedicine.eldoc.ub.rug.nl/root/ejim/. Accessed May 25 2008.

Hunter, W. W. 1883. *The Imperial Gazetteer of India* (Vol. II). London: Trubner & Co.

Hunter, W. W. 1891. *State Education for the People*. London: George Routledge and Sons.

Indian Medical Gazette, a *monthly record of Medicine, Surgery, Obstetrics, Jurisprudence and Collateral sciences: general medical intelligence, Indian and European*. 1868. 3: 87-89. Calcutta: WYMV Bros.

Jacquemont, V. 1835. *Letters from India Describing a Journey in the British Dominions of India, Tibet, Lahore, and Cashmere during the Years 1828, 1829, 1839, 1831*. London: Edward Churton.

Jarcho, Saul. 1961. Auenbrugger, Laennec, and John Keats: Some notes on the Early History of Percussion and Auscultation. *Medical History* 5: 167-172.

Jewson, N. D. 1974. Medical Knowledge and the Patronage System in 18th Century England. *Sociology* 8 (3): 369-385.

Jewson, N. D. 1976. The Disappearance of the Sick Man from Medical Cosmology. *Sociology* 10 (2): 225-244.

Jolly, Julius. 1880. *The Institutes of Vishnu*. Oxford: Clarendon Press.

Jolly, Julius. 1977. *Indian Medicine*, trans. C. G. Kashikar. New Delhi: Munshiram Manoharlal.

Jones, W. H. S, trans. 1931. *The Loeb Classical Library: Hippocrates*, Vol. I. Cambridge, Massachusetts: Harvard University Press.

Joseph, Jacques. 1987. *Rhinoplasty and Facial Plastic Surgery with a Supplement on Mammaplasty*, ed. Stanley Milestein, 217-221. San Francisco: J Norman & Co.

Kakar, Sudhir. 1998. *Shamans, Mystics, And Doctors: A Psychological inquiry into India and its Healing Traditions*. New Delhi: Oxford University Press.

Kalpagam, U. 1999. Temporalities, History and Routines of Rule in Colonial India. *Time and Society* 8 (1): 141-159.

Kandela, Peter. 1998. Fighting Elitism and Corruption in Medical Education. *Lancet* 352 (9124): 333-335.

Kapila, Shruti. 2005. Masculinity and Madness: Princely Personhood and Colonial Sciences of the Mind in Western India 1871-1940. *Past and Present* 187 (1): 121-156.

Kaye, J. W. 1853. *The Admininistration of the East India Company; A Historry of Indian Progress*. London: Richard Bentley.

Keay, F. E. 1918. *Ancient Indian Education*. London, New York: Oxford University Press.

Keel, Othmar. 1999. Was Anatomical and Tissue Pathology a Product of the Paris Clinical School or Not? In *Constructing Paris Medicine*, ed. Caroline Hannaway and Ann La Berge, 117-183. Amsterdam, Atlanta, GA: Rodopi, 1999.

Kellett, C. E. 1964. Two Anatomies. *Medical History* 8: 342-353.

Kern, Stephen. 2000. Time and Medicine. *Annals of Internal Medicine* 132 (1): 3-9.

Khaleeli, Zhaleh. 2001. Harmony or hegemony? The rise and fall of the Native medical Institution, Calcutta in 1822-35. *South Asia Research* 21 (1): 77-104.

King, L. S and M. C. Meehan. 1973. A history of the autopsy. A review. *American Journal of Pathology* 73 (2): 513-544.

Kirwan, E. O'G. 1937. Early Ophthalmologists in Calcutta. *British Journal of Ophthalmology* 21: 638-644.

Kleinman, Arthur. 1998. *Experience and Its Moral Modes: Culture, Human Conditions, and Disorder* (The Tanner Lectures on Human Values), delivered at Stanford University, April 13-16, 1998.

Kopf, David. 1969. *British Orientalism and Bengal Renaissance: The Dynamics of Indian Modernization 1773-1835*. Calcutta: Firma K. L. Mukhopadhyay.

Korf, H. W and H. Wicht. 2004. The History of Medicine on the Public Cadavers. *Nature* 428: 805.

Krishna, Daya. 2006. *Developments in Indian Philosophy from Eighteenth Century Onwards: Classical and Western*. New Delhi: Centre for Studies in Civilizations.

Kumar, Deepak. 2006. *Science and the Raj: A Study of British India*. New Delhi: Oxford University Press.

Kunte, A. M (revised and ed.). 1902. *Aṣṭāṅgahṛdaya*, 3rd edn. Bombay: Nirnaya-Sagar Press.

Kuriyama, Shigehisa. 1993. Between Mind and Eye: Japanese Anatomy in the Eighteenth Century. In *Paths to Asian Medical Knowledge*, ed. Charles Leslie and Allan Young, 21-43. New Delhi: Munshiram Manoharlal Publishers Pvt. Ltd.

Kutumbiah, P. 1999. *Ancient Indian Medicine*. Chennai: Orient Longman.

Lad, Vasant Dattatray. 2007. *Secrets of the Pulse: The Ancient Art of Pulse Diagnosis*. Delhi: Motilal Banarsidass.

Lakhani, S. 1991. Early clinical pathologists. 4: John Hunter (1728-1793). *Journl of Clinical Pathology* 44: 621-623.

Lambert, Claude-Francois. 1750. *A Collection of Curious Observations on the Manners, Customs, Usages, different Languages, Government, mythology, Chronology, Ancient and Modern Geography, Ceremonies, Religion, Mechanics, Astronomy, Medicine, Physics, Natural History, Commerce, Arts, and Sciences, of the Several Nations of Asia, Africa, and America*, trans. John Dunn, Vol. I. London: Printed for the Translator.

Lancet. ii (1867). The methods and aims of medical education.

Lane, Joan. 2001. *A Social History of Medicine: Health, Healing and Disease in England, 1750-1950*. London, New York: Routledge.

Langford, Jean. 1995. Ayurvedic Interiors: Person, Space, and Episteme in Three Medical Practices. *Cultural Anthropology* 10 (3): 330-366.

Larson, Gerald James. 1987. Āyurveda and the Hindu Philosophical Systems. *Philosophy East and West* 37 (3): 245-259.

Larwood, H. C. 1958. Science in India before 1850. *British Journal of Educational Studies* 7 (1): 36-49

Latham, Stephen R. 2002. Medical professionalism: A Parsonian view. *The Mount Sinai Journal of Medicine*. 69 (6): 363-369.

Latour, Bruno. 1999. *Science in Action: How to follow scientists and engineers through society*. Cambridge, Massachusetts: Harvard University Press.

Lawrence, Susan C. 1988. Entrepreneurs and Private Enterprise: The Development of Medical Lecturing in London, 1775-1820. *Bulletin of the History of Medicine* 62 (2): 171-192.

Lawrence, Susan C. 1993. Educating the senses: students, teachers and medical rhetoric in eighteenth-century London. In *Medicine and the Five Senses*, ed. W. F. Bynum and R. Porter, 154-178. Cambridge: Cambridge University Press.

Lawrence, Susan C. 1998. Beyond the Grave –The Use and Meaning of Human Body Parts: A Historical Introduction. In *Stored Tissue Samples: Ethical, Legal, and Public Policy Implications,* ed. Robert F. Weir, 111-142. Iowa City: University of Iowa Press.

Leach, Edmund. 1975. Society's expectations of health. *Journal of Medical Ethics* 1: 85-89.

Lee, Richard V. 2000. Doctoring to the Music of Time. *Annals of Internal Medicine* 132 (1): 11-17.

Leidy, Joseph. 1859. *Lecture Introductory to the Course on Anatomy in the University of Pennsylvania for the Session 1858-59.* Philadelphia: Collins.

London Medical Gazette, Friday, July 16 1847.

London Medical Gazette or Journal of Practical Medicine, Vol. V. 1847. London: Longman, Brows, Green, and Longmans.

Longmate, Barak. 1794. Curious Chirurgical Operation. *The Gentleman's Magazine* 64 (2): 891-892.

Lourdusamy, J. 2004. *Science and National Consciousness in Bengal 1870-1930.* New Delhi: Orient Longman.

Lushington, C. 1824. *The History, Design and Present State of the Religious, Benevolent and Charitable Institutions; Founded by the British in Calcutta and its Vicinity.* Calcutta: Hindostanee Press.

Maas, Philipp. 2007-2008. The concepts of the human body and disease in classical Yoga and Ayurveda. *Vienna Journal of South Asian Studies* 51: 125-162.

MacDonald, Helen. 2007. A Scandalous Act: Regulating Anatomy in a British Settler Colony, Tasmania 1869. *Social History of Medicine* 20 (1): 39-56

Macdonell, Arthur A. 1900. *A History of Sanskrit Literature.* New York: D. Appleton and Company.

Macdonell, Arthur A. and Keith, A. B. 1912. *Vedic Index*, Vol. I & II. London: John Murray.

MacKinney, Loren C. 1962. The Beginning of Western Scientific Anatomy: New Evidence and a Revision in Interpretation of Mondeville's Role. *Medical History* 6 (3): 233-239.

Malamoud, Charles. 2004. The Sacrificing Animal. In *India and Indology: Past Present and Future (Bharat O Bharat Tatwa: Atit Bartaman Abong Bhabisyat)*, ed. Sukumari Bhattacharya, 516-525. (Calcutta: National Book Agency.

Mandal, Panchanan. 1953. *Chithipatre Samajchitra* (Social Picture through Letters), Vol. II. Santiniketan: Visva Bharati.

Manucci, Niccolao. 1907. *Storia do Mogor or Mogul India 1653-1708*, trans. William Irvine, Vol. I, II, III & IV. London: John Murray.

Mayaram, Shail. 2006. *Against History, Against State: Counterperspectives from the Margins*. New Delhi: Permanent Black.

Marinker, Marshal. 1975. Why make people patients? *Journal of Medical Ethics* 1: 81-84.

Markham, Clements, trans. 1913. *Colloquies on the Simples and Drugs of India by Garcia da Orta* [a translation of Conde de Ficalho, Lisbon, I891-5], London: Henry Sotheran & Co.

Matuk Camillia. 2006. Seeing the Body: The Divergence of Ancient and Western Medical Illustration. *Journal of Biocommunication* 32 (1): 1-8.

McNeil, Barbara J. 2001. Shattuck Lecture – Hidden Barriers to Improvement of the Quality of Care. *New England Journal of Medicine* 345: 1612-1620.

McVaugh, Michael R. 1997. Bedside Manners in the Middle Ages. *Bulletin of the History of Medicine* 71 (2): 201-223.

Malamoud, Charles. 2004. The Sacrificing Animal. In *India and Indology: Past Present and Future (Bharat O Bharat Tatwa: Atit Bartaman Abong Bhabisyat)*, ed. Sukumari Bhattacharya, 516-526. Calcutta: National Book Agency.

Marinker, Marshal. 1975. Why make people patients? *Journal of Medical Ethics* 1: 81-84.

Martin, Montgomery. 1838. *The History, Antiquities, Topography, and Statistics of Eastern India*, Vol. III. London: W. H. Allen & Co.

Matilal, Bimal K. 1997. *Logic, Language and Reality*. Delhi: Motilal Banarsidass.

Matilal, Bimal K. 1999. *The Character of Logic in India*, ed., Jonardon Ganeri and Heeraman Tiwari. New Delhi: Oxford University Press.

Matsumoto, Masatoshi, Kazuo Inoue and Eiji. Kajii. 2001. Words of Tohkaku Wada: medical heritage in Japan. *Journal of Medical Ethics* 27: 55-58.

Matuk, Camillia. 2006. Seeing the Body: The Divergence of Ancient and Western Medical Illustration. *Journal of Biological Communication* 32 (1): 1-8.

Mayaram, Shail. 2006. *Against History, Against State: Counterperspectives from the Margins*. New Delhi: Permanent Black.

Mazars, Guy. 2006. *A Concise Introduction to Indian Medicine*. Delhi, Motilal Banarsidass.

McDonald, Donald. 1956. The Indian Medical Service. A Short Account of its Achievements. *Proceedings of the Royal Society of Medicine* 49 (1): 1-5.

Mcdonell, Arthur A. and A. B. Keith, *Vedic Index of Names and Subjects*, Vols. I & II (London: John Murray, 1912).

McNeil, Barbara J. 2001. Shattuck Lecture – Hidden Barriers to Improvement of the Quality of Care. *New England Journal of Medicine* 345: 1612-1620.

McVaugh, Michael R. 1997. "Bedside Manners in the Middle Ages," *Bulletin of the History of Medicine* 71 (2): 201-223.

Medical College Centenary Volume. 1935. Calcutta: Centenary Volume Committee.

Meindersma, T. E. 1992 Caraka and the materialists. *WZKSOA* 36 (Supplement): 299-306.

Menon, I. A. and Haberman, H. F. 1970. The Medical Students' Oath of ancient India. *Medical History* 14: 295-299.

Metcalf, Thomas R. 1998. *Ideologies of the Raj*. Cambridge: Cambridge University Press.

Meulenbeld, G. Jan. 1991. The constraints of theory in the evolution of nosological classifications: A study on the position of blood in Indian medicine (Āyurveda). In *Medical Literature from India, Sri Lanka and Tibet*, ed. G. Jan Meulenbeld, 91-106. Leiden, New York: E. J Brill.

Meulenbeld, G. J. 1992. The Characteristics of a *Doṣa*. *Journal of European Āyurvedic Society* 2: 1-5.

Meulenbeld, G. J. 1995. The Many Faces of Āyurveda. *Journal of European Āyurvedic Society* 4: 1-10.

Meulenbeld, G. J. 1999-2002. *History of Indian Medical Literature*, Vol. IA, IB, IIA, IIB & III. Groningen: Egbert Forsten.

Meulenbeld, G Jan. 2007. The Sarasvatīnighaṇṭu – Review article. *eJournal of Indian Medicine* I: 21–44.

Meulenbeld, G. J. 2008a. *The Mādhavanidāna: With 'Madhukośa', the Commentary by Vijayarakṣita and Śrīkaṇṭhadatta* (Chapters 1-10). Delhi: Motilal Banarsidass.

Meulenbeld, G. J. 2008b. Some Neglected Aspects of Āyurveda or the Illusion of a Consistent Theory. II: The *Suśrutasaṃhitā*. *Traditional South Asian Medicine* 8: 16-31.

Meulenbeld, G Jan. 2009. The trees called śigru (Moringa sp), along with a study of the drugs used in errhines. *eJournal of Indian Medicine*. Supplement 1. Reference: http://www.indianmedicine.nl. Accessed 20 July 2008.

Mines, Diana P. 1997. From Homo Hierarchicus to Homo Faber: Breaking Convention through Semiosis. *Irish Journal of Anthropology* 2: 33-44.

Mitra, Peary Chand. 1877. *A Biographical Sketch of David Hare*. Calcutta: W. Newman.

Mohanty, J. N. 2001. *Explorations in Philosophy: Essays by J. N. Mohanty*, ed. Bina Gupta. New Delhi: Oxford University Press.

Monier-Wiliams, Monier. 2002. *A Sanskrit-English Dictionary*. Delhi: Motilal Banarsidass.

Moore, W. J. 1862. *Health in the Tropics; or, Sanitary Art Applied to Europeans in India*. London: John Churchill.

Moore, W. J. 1886. *A Manual of the Diseases of India with A Compendium of Diseases Generally*. London: J. & A. Churchill.

Moore, Wendy. 2005. A Surgical History. *CMAJ* 172 (1): 1713-1714.

Morehead, Charles. 1860. *Clinical Researches on Diseases in India*, 2nd edn. London: Longman, Green, Longman, and Roberts.

Muir, J. 1868. *Original Sanskrit Texts on the Origin and History of the People of India*, Vol. V. London: Trubner & Co.

Mukhopadhyaya, Girindranath. 1974. *A History of Indian Medicine*, Vol. I, II & III (original print, 1922-1929). Delhi: Oriental Books Reprint Corporations.

Mukhopaddhyaya, Trailokyanath. 1883. *A Descriptive Catalogue of Indian Produce Contributed to the Amsterdam Exhibition of 1883.* Calcutta: Superintendent of Govt. Printing.

Murray, H., Wilson, J., Greville, R. K., Jameson, R., Ainslie, W., Rhind, W., Wallace, W. & Dalrymple, C. 1832. *Historical and descriptive account of British India, from the most remote period to the present time (1832).* New York: J. Harper.

Nag, Brajendra Chandra, trans. 1994. *Carakasaṃhitā*. Vol. I & II. Calcutta: Navapatra Prakashan.

Nakamura, Hajime. 1992. *A Comparative History of Ideas*. Delhi: Motilal Banarsidass.

Nandy, Ashis. 1987. *The Intimate Enemy: Loss and Recovery of Self under Colonialism.* New Delhi: Oxford University Press.

Nandy, Ashis. 1995. *The Savage Freud and Other Essays on Possible and Retrievable Selves.* New Delhi: Oxford University Press.

Narasimha, Roddam. 2003. The Indian half of Needham question: Some thoughts on axioms, models, algorithms and computational positivism. *Interdisciplinary Science Reviews* 28 (1): 54-66.

Narasimha, Roddam. 2007. Epistemology and Language in Indian Astronomy and Mathematics. *Journal of Indian Philosophy* 35 (5-6): 521-542.

Nature. December 21 1871. Results of Saniatry Improvement in Calcutta ill: 151-152. Reference: http://digital.library.wisc.edu/1711.dl/HistSciTech.Nature18711221. Accessed 12 January 2007.

Newman, Charles. 1958. Physical Signs in the London Hospitals: A chapter in the History of the Introduction of Physical Examination. *Medical History* 2 (3): 195-201.

Newman, Charles. 1960. Diagnostic Investigation before Laennec. *Medical History* 4 (4): 322-329

Nicolson, Malcom. 1988. The Metastatic Theory of Pathogenesis and the Professional Interests of the Eighteenth-Century Physician. *Medical History* 32 (3): 277–300.

O'Flaherty, Wendy D. 1986. *Dreams, Illusion, and Other Realities*. Chicago: University of Chicago Press.

O'Malley, L. S. S, ed. 1941. *Modern India and the West: A Study of the Interaction of Their Civilization.* London, New York: Oxford University Press.

Obeyesekere, Gananath. 1993. Science, Experimentation, and Clinical Practice in Āyurveda. In *Paths to Asian Medical Knowledge*. edited by Charles Leslie and Allan Young, 160-176. New Delhi: Munshiram Manoharlal Publishers Pvt. Ltd.

Older, J. 2004. Anatomy: A must for teaching the next generation. *The Surgeon: Journal of the Royal College of Surgeons of Edinburgh and Ireland* 2 (2): 79-90.

Oriental Herald and Journal of General Literature Vol. X. 1826.

Otis, Laura. 2000. *Membranes and Metaphors: Metaphors of Invasion in Nineteenth-Century Literature, Science and Politics*. Baltimore, London: The Johns Hopkins University Press.

Pan, N. 1919. Some Observation on the Gastro-Intestinal Tract of the Hindus. *Journal of Anatomy* 53 (pt. 2 and 3): 259-265.

Pande, Ishita. 2005. Curing Calcutta: Race, liberalism, and colonial medicine in British Bengal, 1830-1900 (India). PhD thesis, Princeton University. Publication number AAT 3188655.

Panikkar, K. N. 2001. *Culture, Ideology, Hegemony: Intellectuals and Social Consciousness in Colonial India*. New Delhi: Tulika.

Parbury's Oriental Herald and Colonial Intelligencer: containing a faithful digest of such information as must be considered generally interesting from the British Indian Nations II. 1838. London: Madden & Co.

Patterson, George Murray. 1824. On the Phrenology of Hindostan. *Transactions of the Phrenological Society* XIII: 430-448. Edinburgh: John Anderson Jun.

Patterson, T. J. S. 2001. The relationship of Indian and European practitioners of medicine from the sixteenth century. In *Studies on Indian Medical History*, ed. G. Jan Meulenbeld, and Dominik Wujastyk, 111-120. Delhi: Motilal Banarasidass.

Payne, Lynd. 2007. *With Words and Knives: Learning Medical Dissection in Early Modern England*. London: Ashgate Publishing.

Pearson, M. N. 1995. The Thin End of the Wedge. Medical Relativities as a Paradigm of Early Modern Indian-European Relations. *Modern Asian Studies* 29 (1): 141-170.

Peet, John. 1864. *The Principles and Practice of Medicine; Designed Chiefly for Students of Indian Medical Colleges*. London: John Churchill.

Peirce, Charles S. 1955. *Philosophical Writings*, ed. Justus Buchler. New York: Dover Publications, 1955.

Pennant, Thomas. 1798. *The View of Hindoostan*, Vol. II. London: H. Hughes.

Peterson, M. Jeanne. 1978. *The Medical Profession in Mid-Victorian London*. Berkeley, Los Angeles, London: University of California Press.

Pierce, Charles S. 1955. *Philosophical Writings*, ed. Justus Buchler. New York: Dover Publications.

Pingree, David Erwin. 1970-1994. *Census of the Exact Sciences in Sanskrit*, Series A, Vols. I–V. Philadelphia: American Philosophical Society.

Pitman, Vicki. 2006. *The Nature of the Whole: Holism in Ancient Greek and Indian Medicine*. Delhi: Motilal Banarasidass.

Pollock, Sheldon. 1985. The Theory of Practice and the Practice of Theory in Indian Intellectual History. *Journal of the American Oriental Society* (Indological Studies Dedicated to Daniel H. H. Ingalls) 105 (3): 499-519.

Pollock, Sheldon. Indian medical knowledge systems on the eve of colonialism. 2000. *Intellectual History Newsletter* 22: 1-16.

Pollock, Sheldon. 2001. The Death of Sanskrit. *Comparative Studies in Society and History* 43 (2): 392-426.

Pollock, Sheldon. 2002. Introduction: Working Papers on Sanskrit Knowledge Systems on the Eve of Colonialism. *Journal of Indian Philosophy* 30 (5): 431-439.

Pollock, Sheldon. 2004. Forms of Knowledge in Early Modern South Asia: Introduction. *Comparative Studies of South Asia, Africa and the Middle East* 24 (2): 19-21.

Pollock, Sheldon. 2007. Pretextures of Time. *History and Theory* 46: 364 381.

Porter, Roy. 1999. *The Greatest Benefit to Mankind*. London: Fontana Press.

Prakash, Gyan. 2000. *Another Reason: Science and the Imagination of Modern India*. New Delhi: Oxford University Press.

Proceedings of the Asiatic Society of Bengal, January to December, 1892. 1893. Calcutta: Baptist Mission Press.

Proceedings of the Lieutenant-Governor of Bengal, No. 367. August 1872. (West Bengal State Archives)

Qaisar, Ahsan Jan. 1998. *The Indian Response to European Technology and Culture (AD 1498-1707)*. New Delhi: Oxford University Press.

Quaiser, N. 2006. Politics, Culture and Colonialism: Unani's Debate with Doctory. In *Health, Medicine and Empire: Perspectives on Colonial India*, edited by Mark Harrison and Biswamay Pati, 317-355. New Delhi: Orient Longman.

Rai, N. P, Tiwari, S. K, Upadhyaya, S. D and Chaturvedi, G.N. 1981. The Origin and Development of Pulse Examination in Medieval India. *Indian Journal of History of Science* 16 (1): 77-88.

Raj, Kapil. 2006. *Relocating Modern Science: Circulation and the Construction of Scientific Knowledge in South Asia and Europe*. New Delhi: permanent black.

Rao, M. S. 1968. The History of Medicine in India and Burma. *Medical History* 12: 52-61.

Raman, C. V. 1944. Scientific Researches. *Annals of the American Academy of Political and Social Science* 233: 39-45.

Rao, Velcheru Narayana, Shulman, David and Subrahmanyam, Sanjay. 2001. *Textures of Time: Writing History in South India 1600–1800*. Delhi: Permanent Black.

Rao, V. N, David Shulman and Sanjay Subrahmanyam. 2007. A Pragmatic Response. *History and Theory* 46 (3): 409-427.

Ray, P, H. N. Gupta and Mira Roy, ed. 1993. *Suśruta Saṃhitā (A Scientific Synopsis)*. New Delhi: Indian National Science Academy.

Rasmussen, H. 1975. Medical Education – Revolution or Reaction. *Pharos* 38: 53-59.

Ray, Praphulla Chandra. 1903. *A History of Hindu Chemistry from the Earliest Times to the Middle of the Sixteenth Century A.D.*, Vol. I. Calcutta: The Bengal Chemical and Pharmaceutical Works Limited.

Ray Choudhury, compiled. 1987. *Calcutta, a Hundred Years Ago*. Calcutta: Nachiketa Publications Ltd., 1987.

Ray Chaudhuri, Tapan. 1996. The Pursuit of Reason in Nineteenth Century Bengal. In *Mind, Body and Society: Life and Mentality in Colonial Bengal*, edited by Rajat Kanta Roy, 47-64. Delhi: Oxford University Press.

Reddy, Subba D. V. 1966. *Health and Medicine in Mauryan Empire*. Hyderabad: Osmania Medical College.

Reed, Elizabeth A. 1891. *The Ancient Books of India.* Chicago: S. C. Griggs and Co.

Rees, G. O. 1838. On the Proportions of Animal and Earthy Matter in the Different Bones of the Human Body. *Medical and Chirurgical Transaction,* 21: 406-413.

Reiser, Stanley Joel. 1993. The Science of Diagnosis: Diagnostic Technology. In *Companion Encyclopedia of History of Medicine,* Vol. II, ed. W. F. Bynum and Roy Porter, 826-851. London: Routledge.

Robb-Smith, A .H. T. 1962. Unravelling the Functions of the Blood. *Medical History* 6: 1-21.

Reiser, Stanley J. 2000. The Technologies of Time Measurements: Implications at the Bedside and the Bench. *Annals of Internal Medicine* 132 (1): 31-36.

Report of the Cases treated during the Course of Clinical Lectures delivered at the Royal Infirmary in the Session 1834-1835. 1836. *The Edinburgh Medical and Surgical Journal* 46: 1-38.

Richardson, Ruth and B. Hurwitz. 1987. Jeremy Bentham's self image: an exemplary bequest for dissection. *British Medical Journal* 295: 195-198.

Richardson, Ruth. 2000. *Death, Dissection and the Destitute.* Chicago, London: University of Chicago Press.

Richardson, Ruth. 2000a. A potted history of specimen taking. *Lancet* 355: 935-6.

Robb-Smith, A. H. T. 1962. Unravelling the Functions of the Blood. *Medical History* 6 (1): 1-21.

Roberts, M J D. 2009. The Politics of Professionalization: MPs, Medical Men, and the 1858 Medical Act. *Medical History* 53: 37–56.

Rose, Nikolas. 1999. Medicine, History and the Present. In *Reassessing Foucault: Power, Medicine and the Body,* ed. C. Jones & R. Porter, 48-72. London, New York: Routledge.

Roy, Binay Bhusan 1990. Native Hospital o Fever Hospital (Native Hospital and Fever Hospital). In *Kolkatar Purakatha (Old Stories of Calcutta),* ed. Debashis Basu, 182-205. Calcutta: Pustak Bipani.

Roy, Binay Bhusan. 1998. *Unish Shatake Banglar Chikitsabyabastha, Deshiya Deshiya Beshaj O Sarkar* (Medical System, Indigenous Herbs and Government in Bengal in Nineteenth Century). Delhi: International Centre for Bengal Studies.

Roy, Mira. 1967. Anatomy in the Vedic Literature. *Indian Journal of History of Science* 2 (1): 35-46.

Roy, Mira. 2004. Āyurveda. In *The Cultural Heritage of India*. Vol. I (Science and Technology), ed. Priyadaranjan Ray and S. N. Sen, 152-176. Calcutta: The Ramkrishna Mission Institute of Culture.

Roy, Ram Mohan. 1973. *Ram Mohan Rachanabali* (Collected Works of Ram Mohan in Bengali). Calcutta: Haraf Prakashani.

Roy Choudhury, Ranabir, ed. 1987. *Calcutta a Hundred Years Ago*. Calcutta: Nachiketa Publications Ltd.

Royle, J. F. 1837. *An Essay on the Antiquity of Hindoo Medicine Including an Introductory Lecture to the Course of Materia Medica and Therapeutics, Delivered at King's College*. London: Wm. H. Allen & Co. and J. Churchill.

Saha, Mridula. 1999. *History of Indian Medicine based on Vedic Literature: Śatapatha Brahmaṇa*. Kolkata: The Asiatic Society.

Samachar Darpan 13 June 1818.

Samachar Darpan, 11 June 1825.

Samachar Darpan, 19 December 1835.

Sanyal, Pulinchandra. 1888. Vivaha-vichar (Judgment of marriage). *Chikitsa Sammilani (Assembly of Medicine)*. Calcutta.

Sappol, Michael. 2001. *A Traffic of Dead Bodies: Anatomy and Embodied Social Identity in Nineteenth-Century America*. Princeton, New Jersey: Princeton University Press.

Sarkar, Sumit. 2002. *Writing Social History*. New Delhi: Oxford University Press.

Sastri, K.A. Nilakanta. 1964. Modern India and the West. *Diogenes* 12: 120-142.

Scharfe, Hartmurt. 1999. The Doctrine of the Three Humors in Traditional Indian Medicine and the Alleged Antiquity of Tamil Siddha Medicine. *Journal of the American Oriental Society* 119 (4): 609-629.

Sen, Keshub Chander. 1916. The Study of Science. In *Keshub Chander Sen's Essays: Theological and Ethical*, 5th Edn. Calcutta: Brahmo Tract Society.

Sen, Gananath. 1916. *Hindu Medicine*. Madras.

Sen, Gananth. 1924. *Śārīr-Parichay: Pūrvardha (Introduction to Anatomy: First Half)*. Calcutta: Kalpataru Āyurveda Bhavan.

Sen, Gananath. 1944. *Āyurveda Parichay (Introduction to Āyurveda).* Calcutta: Visva Bharati Granthalaya.

Sengupta, Debendranath and Upendranath Sengupta. 1890.

Shaffer, Kitt. 2004. Teaching Anatomy in the Digital World. *New England Journal of Medicine* 351: 1279-1281.

Scharfe, Hartmurt. 1999. The Doctrine of the Three Humors in Traditional Indian Medicine and the Alleged Antiquity of Tamil Siddha Medicine. *Journal of the American Oriental Society* 119 (4): 609-629.

Schuette–Hoffman, Allison and Nancy A Bernardo. 2006. Public Anatomy. *The South Shore Journal* 1: 69-84.

Scudamore, Charles. 1826. *Observations on Mr. Laennec's Method of Forming a Diagnosis of the Diseases of the Chest by Means of the Stethoscope, and of Percussion; and upon Some Points of the French Practice of Medicine.* London: Longman, Rees, Orme, Brown, and Green.Sen Gupta, P. C. 1970. Soorjo Coomar Goodeve Chuckerbutty: the first Indian contributor to modern medical science. *Medical History* 14: 183–191.

Sen Sharma, K. & Bhattacharya, S. (1998). *Śārṅgadharasaṃhitā.* Calcutta: Dipayan.

Sen, Gananath. 1916. *Hindu Medicine* (an address delivered at the Hindu University Foundation Ceremony, Benaras). Calcutta: Kalpataru Āyurveda Bhavan.

Sen, Gananath. 1924. *Śārīr Parichay (pūrvārdha).* Calcutta: Kalpataru Āyurveda Bhavan.

Sen, Gananath. 1943. *Āyurveda Parichay.* Calcutta: Visva Bharati Granthalaya.

Sen, Shankar annotated. 1999. *Nāḍīprakāś o Nāḍīvijnān, composed by Mahāmuni Kaṇāda*, ed. Kalikinkar Sen Sharma and Satya Sekhar Bhattacharya. Kolkata: Dipayan.

Sengupta, P. C. 1970. Soorjo Coomar Goodeve Chuckerbutty: the first Indian contributor to modern medical science. *Medical History* 14 (2): 183-191.

Sengupta, Dedranath and Upendranath Sengupta, compiled and ed. 1902. *Āyurveda Saṃgraha (pariśiṣṭa).* Calcutta: C. K. Sen & Co.

Seton-Karr, W. S. 1865. *Selections from Calcutta Gazettes*, Vol. II. Calcutta: O. T. Cutter, Military Orphan Press.

Shanks, David. 2002. Muscularity and the Western Medical Tradition. *Hirundo: The McGill Journal of Classical Studies* II: 58-81.

Sharma, Priya Vrat. 1992. Introduction. In *History of Medicine in India*, ed. Priya Vrat Sharma. New Delhi: Indian National Science Academy.

Sharma, Priya Vrat. 1992a. Medicinal Plants in the Vedas. In *History of Medicine in India*, ed. Priya Vrat Sharma, 37-68. Delhi: Indian National Science Academy.

Sharma, Priya Vrat. 1992b. On the *Dravyaguṇasaṅgraha* of Cakrapāṇidatta. *Journal of European Āyurvedic Society* 2: 82-88.

Sharma, Priya Vrat. 1998. *Essentials of Āyurveda*. Delhi: Motilal Banarasidass.

Sharma, Ram Karan and Bhagwan Dash, trans. 1977. *Agniveśa's Caraka Samhitā (Text with English Translation and Critical Exposition Based on Cakrapāni Datta's Āyurveda Dīpikā)*. Varanasi: Chaukhamba Publishers.

Sharma, Shiv. 1929. *The System of Āyurveda*. New Delhi: Neeraj Publishing House.

Shastri, Shivnath. 2007. *Ramtanu Lahiri O Tatkalin Bangasamaj* (Ramtanu Lahiri and Contemporary Bengali Social World). Calcutta: New Age Publishers.

Shekhawat, Virendra. 1984. Standards of Scientific Investigation: Logic and Methodology of Science in *Caraka Saṃhitā*. *Indian Journal of History of Science* 19 (3): 224-252.

Shorter, Edward. 1993. The History of the Doctor-Patient Relationship. In *Companion Encyclopedia of the History of Medicine* ed. W. F. Bynum and Roy Porter, Vol. II, 783-800. London, New York: Routledge.

Sigerist, Henry E. 1962. *The Great Doctors: A Biographical History of Medicine*. New York: Doubleday Anchor Books.

Singer, Charles. 1957. The Strange Histories of Some Anatomical Terms. *Medical History* 3: 1-7.

Singer, Charles and S. W. F. Holloway. 1960. Early Medical Education in England in Relations to the Pre-history of London University. *Medical History* 4: 1-17.

Sinh Jee, Bhagwat. 1896. A Short History of Aryan Medical Science. London: Macmillan and Co.

Sivaramakrishnan, Kavita. 2006. Constructing Boundaries, Contesting Identities: The Politics of Ayurved in Punjab (1930-1940). *Studies in History* 22 (2): 253-283.

Smith, George. 1879. *The life of Alexander Duff*. New York: A. C. Armstrong & Son.

Sommers, K. 1958. Notes on Rauwolfia and ancient medical writings of India. *Medical History* 2 (2): 87-91.

Spratling, Edgar J. 1902. The Physician as a Social Economic Factor. *Journal of American Medical Association (JAMA)* 38: 1688-1689.

Staal, Frits. 1996. *Rituals and Mantras: Rules without Meaning*. Delhi: Motilal Banarsidass.

Stanley, Peter. 2003. *For Fear of Pain: British Surgery, 1790-1850*. Amsterdam, New York: Rodopi.

Stenhouse, John 1856. Examination of select Vegetable Products from India. *Philosophical Transactions of Royal Society* 156: 141-157.

Stokes, Eric. 1959. *English Utilitarians and India*. Oxford: Clarendon Press.

Sturdy, Steve and Roger Cooter. 1998. Science, Scientific Management, and the Transformation of Medicine in Britain *C*. 1870–1950. *History of Science 36*: 1-47.

Sullivan, Lawrence E. 1989. "Introduction: The Quest for Well-Being and the Questioning of Medicine". In *Healing and Restoring: Health and Medicine in the World's Religious Traditions*, ed. Lawrence E. Sullivan, 1-10. New York, London: Macmillan Publishing Company.

Tagore, Dwaraka Nath. 1836. *Dwarakanath Tagore File*. Visva Bharati Archives, Santiniketan.

Tagore, Dwijendra Nath. 1891. *Samajik Roger Kaviraji Chikitsa (Ayurvedic Treatment for Social Maladies)*. Calcutta: Kambuliatola Pathya Samity.

Takakusu, J, trans. 1896. *A Record of the Buddhist Religion as Practised in India and the Malay Archipelago (A.D. 671-695)*. Oxford: Clarendon Press.

Tambiah, Stanley J. 1990. *Magic, Science, Religion and the Scope of Rationality*. New York: Cambridge University Press.

Tauber, Alfred J. 2005. Medicine and the Call for a Moral Epistemology. *Perspectives in Biology and Medicine* 48: 42-53.

Thakur, Krishna Chaitanya. 1994. Introduction. In *Carakasaṃhitā*, trans. B. C. Nag, Vol. I, 1-8. Calcutta: Nabapatra Prakashan.

Thapar, Romila. 2006. *Time as a Metaphor of History: Early India*. Delhi: Oxford University Press.

Thatte, D. G, Tiwari S. P. & Tiwari, G. P. 1981. Techniques of Venupuncture (*śirāvedha*) in India in 18th Century. *Indian Journal of History of Science* 16 (2): 181-188.

Thatte, D. G. 2005. *Suśruta-saṃhitā (Selections on the Study of Human Body)* (Vol. III). Varanasi: Chaukhamba Publishers.

Calcutta Monthly Journal and General Register of Occurrences. For the year1836. 1837. Calcutta: Samuel Smith and Co.

Thompson, E. P. 1967. Time, Work-Discipline, and Industrial Capitalism. *Past and Present* 38 (1): 56-97.

Transactions of the Medical and Physical Society of Calcutta IV. 1829.

Transactions of the Phrenological Society. 1824. Edinburgh: John Anderson Jun.

Trawick, Margaret. 1993. Death and Nurturance in Indian Systems of Healing. In *Paths to Asian Medical Knowledge*, ed. Charles Leslie and Allan Young, 129-159. New Delhi: Munshiram Manoharlal.

Trevelyan, Charles E. 1838. *On the Education of the People of India.* London: Longman, Orme Brown & Green.

Tröhler, U. 2001. The History of Clinical Effectiveness. *Proceedings of Royal College of Physicians Edinburgh* 31, Suppl. 9: 42-45.

Turner, Bryan S. 2006. Body. *Theory, Culture & Society* 23: 223-226.

Urdang, G. 1946. Pharmacopoeias as Witness of World History. *Journal of the History of Medicine and Allied Sciences* 1 (1): 46-70.

Vandenbroucke, Jean P. 1998. Clinical investigation in the 20th century: the ascendancy of numerical reasoning. *Lancet* 352: S12 - S16.

Varier, P. S. 2005. *Aṣṭāṅgaśārīraṃ.* Varanasi: Chowkhamba Sanskrit Series Office.

Venkatasubbaiah, A. 1932. *Vedic Studies.* Mysore: Surabhi and Company.

Varier. P. S. 2005. *Aṣṭāṅgaśārīraṃ.* Varanasi: Chowkhamba Sanskrit Series Office.

Veer, Peter van der. 2001. *Imperial Encounters: Religion and Modernity in India and Britain.* Princeton, NJ: Princeton University Press.

Vernede, R. V, ed. 1995. *British Life in India.* New Delhi: Oxford University Press.

Viswanathan, Gauri. 1989. *Masks of Conquest: Literary Study and British Rule in India.* London: Faber and Faber,

Vernede, R. V, ed. 1995. *British Life in India*. New Delhi: Oxford University Press.

Viswanathan, Gauri. 1989. *Masks of Conquest: Literary Study and British Rule in India*. London: Faber and Faber,

Waddington, Ivan. 1973. The Role of Hospital in the Development of Modern Medicine: A Sociological Analysis. *Sociology* 7 (2): 211-224.

Warner, John Harley and J. Rizzolo, Lawrence. 2006. Anatomical Instruction and Training for Professionalism from the 19th to the 21st Centuries. *Clinical Anatomy* 19: 403-414.

Warren, C. Peter W. 1999. The history of diagnostic technology. *CMAJ* 161 (9): 1161-1163.

Watts, Sheldon. 2007. Cholera Politics in Britain in 1879: John Nutten Radcliff's Confidential Memo on "Quarantine in the Red Sea". *The Journal of the Historical Society* VII (3): 291-348.

Weber, Albrecht. 1892. *The History of Indian Literature*, trans. John Mann and Theodor Zachariae. London: Trubner & Co.

Weisz, George. 2003. The Emergence of Medical Specialization in the Nineteenth Century. *Bulletin of the History of Medicine* 77: 536-575.

Weisz, George. 2005. From Clinical Counting to Evidence-Based Medicine. In *Body Counts: Medical Quantification in Historical and Sociological Perspectives// Perspectives historiques et sociologiques sur la quantification médicale*, edited by Gérard Jorland, Annick Opinel and George Weisz, 377-393. Montreal, Quebec: McGill-Queens Press.

West Bengal State Archives. 1839. *General Committee of the Fever Hospital and Municipal Improvements, Appendices D-F*, Vol. 7.

Whitney, William Dwight, trans. 1905. *Atharva-Veda Saṃhitā*, Vol. II. Cambridge. Massachusetts: Harvard University.

Whitney, William Dwight. 2002 (1879). *Sanskrit Grammar*. Delhi: Motilal Banarasidass.

William, Adam. 1838. *Third Report on the State of Education in Bengal including Some Account of the State of Education in Behar*. Calcutta: Military Orphan Pres.

Wilson, Horace H. 1864. *Works of the Late Horace Hayman Wilson*, Vol. III. London: Trubner & Co. (Originally published as "On the Medical and Surgical Sciences of the

Hindus". *The Oriental Magazine; and Calcutta Review* 1 (January to June 1823): 207-212, and 349-356.)

Wise, Thomas A. 1860. *Commentaries on the System of Hindu Medicine.* London: Trubner & Co.

Wise, Thomas A. 1867. *Review of the History of Medicine.* London: John Churchill.

Worboys, Michael. 2007. Was there a bacteriological revolution in late nineteenth-century medicine? *Studies in History and philosophy of Biology and Biomedical Sciences* 38: 20-42

Wright-St. Clair, R. E. 1961. History of Surgery and Introductions to Surgical Lectures, by Munro Primus. *Medical History* 5 (3): 286-290.

Wrigley, Richard and George Revill, ed. 2000. *Pathologies of Travel*, Vol. 56, Wellcome Institute Series in the History of Medicine. Amsterdam, Atlanta, GA: Rodopi.

Wujastyk, Dominik. 1993. Indian Medicine. In *Companion Encyclopedia of the History of Medicine*, ed. W. F. Bynum and Roy Porter, 763-765. London, New York: Routledge.

Wujastyk, Dominik. 1998. *The Roots of Ayurveda: Selections from Sanskrit Medical Writings*. New Delhi: Penguin Books.

Wujastyk, Dominik. 2003. The Science of Medicine. In *The Blackwell companion to Hinduism*, ed. G. Flood, 393-410. Oxford: Blackwell.

Wujastyk, Dominik. 2005. Change and Creativity in Early Modern Indian Medical Thought. *Journal of Indian Philosophy* 33 (1): 95-118.

Wujastyk, Dominik. 2007. A Persian Anatomical Image in a non-Muslim Manuscript from Gujarat. *Medical History* 51: 237-242.

Wujastyk, D. 2008. A Body of Knowledge: The Wellcome Ayurvedic Anatomical Man and His Sanskrit Context. *Asian Medicine* 4: 201-248.

Wujastyk, D. 2009. Interpreting the Image of the Human Body in Premodern India. *International Journal of Hindu Studies* 13 (2): 189–228.

Wujastyk, Dominik. *Surgery in Ancient India.* Reference: http://www.ucl.ac.uk/~ucgadkw/uclma/surgery-slides-pdf.pdf. Accessed February 5 2004.

Youngson, Alexander John. 1979. *The Scientific Revolution in Victorian Medicine.* London: Croom Helm.

Zimmermann, Francis. 1993. Gentle Purge: The Flower Power of Āyurveda. In *Paths to Asian Medical Knowledge*, ed. Charles Leslie and Allan Young, 209-223. New Delhi: Munshiram Manoharlal.

Zimmermann, Francis. 1999. *The Jungle and the Aroma of Meats: An Ecological Theme in Hindu Medicine*. Delhi: Motilal Banarsidass.

Zimmermann, Francis. *The Conception of the Body in Ayurvedic Medicine: Humoral Theory and Perception*. Reference: http://philosophindia.fr/india/index.php?id=35. Accessed January 26 2007. (Revised and published on the web in April 2006. An earlier version of this paper was published in 1983 from Heidelberg: Remarks on the conception of the body in Ayurvedic medicine, *South Asian Digest of Regional Writing*, 8 (1979) [actually 1983], *Sources of Illness and Healing in South Asian Regional Literatures*, Heidelberg, University of Heidelberg: 10-26)

Zysk, Kenneth G. 1983. Some Observations on the Dissection of Cadavers in Ancient India. *Ancient Science of Life* 2 (4): 186-188.

Zysk, Kenneth G. 1986. The Evolution of Anatomical Knowledge in India, with Special Reference to Cross-Cultural Influences. *Journal of the American Oriental Society* 106 (4): 687-705.

Zysk, Kenneth G. 1993. The Science of Respiration and the Doctrine of the Bodily Winds in Ancient India. *Journal of the American Oriental Society* 113: 198-213.

Zysk, Kenneth G. 1998. *Medicine in the Veda: Religious Healing in the Veda*. Delhi: Motilal Banarsidass.

Zysk, K. G. 2000a. *Ascetism and Healing in Ancient India: Medicine in the Buddhist Monastery*. Delhi: Motilal Banarsidass.

Zysk, Kenneth G. 2000b. Does Indian Medicine Have a Theory of Contagion? In *Contagion: Perspectives from Pre-Modern Societies*, ed. Lawrence I. Conrad and Dominik Wujastyk, 79-95. London: Ashgate.

List of Publications and Awards

Papers:

(1) *The Body: Epistemological Encounter in Colonial India* – presented at the 1st International Conference on **Making Sense of Health, Illness and Disease** at St. Catherine's College, Oxford University, 2002.

(2) *Epistemology of the Body vs. Indian Colonial Medicine – An Indian Experience* – presented at the **38th International Congress on the History of Medicine**, Istanbul, 2002.

(3) *Human Cadaver and the Rise of 'Modern' Medical Knowledge in Colonial India: Some Preliminary Inquiries* – presented at the **22nd International Congress of History Science**, 24-30 July 2005, Beijing.

(4) "**Encounter in Anatomical Knowledge: East and West**" in *Indian Journal of History of Science* 43, 2 (2008): 163–209.

(5) "**The Knowledge of Anatomy and Health in Āyurveda and Modern Medicine: Colonial Confrontation and Its Outcome**" in *Eä - Revista de humanidades médicas & estudios sociales de la ciencia y la tecnología* (*Journal of Medical Humanities & Social Studies of Science and Technology*) 1, 1 (2009):1-51.

(6) *Construction of Medical Hegemony: An Exploration into Colonial Encounters in Anatomical Knowledge in India* – presented at the **XXIII International Congress of History of Science and Technology**, 28 July-2 August 2009, Budapest.

Books and Book Chapters:

(1) *The Body: Epistemological Encounters in Colonial India*, in **Making Sense of Health, Illness and Disease**, ed. Peter L. Towhig and Vera Kalitzkas (Amsterdam, New York: Rodopi, 2004).

(2) *Modernity and Indigenization: A Study on Biomedical Discourses of Health in India* in ***Anthropology on the Move***, eds., Zahirul Islam and Hasan Shafie (Dhaka, Dept. of Anthropology: University of Dhaka, 2006).

(3) *Death, Embodied Approach and Medicine* in **Science and Spirituality in Modern India,** ed. Makarand Paranjape (New Delhi: JNU, Sambad India Foundation, 2006).

(4) Book in Bengali BIOMEDICINE THEKE NAJARDARI MEDICINE [*From Biomedicine to Surveillance Medicine: Foucault and Beyond*] (Kolkata: Ababhas, 2008).

Edited Volume

Edited the first international collection in Bengali on History of Medicine in India. Title: **Bharatiya Patabhumite Chikitsa Bijnaner Itihas: Samkshipta Paryalochana** (History of Medicine in Indian Context: A Critical Appraisal) [Kolkata: Ababhas, 2009]. Contributors include David Arnold, Francis Zimmermann, Kenneth G. Zysk, Dominik Wujastyk, Waltraud Ernst, Geraldine Forbes, Christiane Hartnack, Rahul Peter Das etc.

Awards

(1) Awarded **Research Associateship** of Indian National Science Academy 2005-2009.

(2) Awarded **Special Certificate of Honor** for "an outstanding essay" by the *Asian Society for the History of Medicine* in 2006.