Chapter 4

MEDICAL AND TECHNICAL EDUCATION

Medical Education

We have given some idea as to the state of medical science in the declining phase of the Muhammadan rule and at the beginning of the British power in India. During this period India was slowly exposed to a number of European medical men and to the European system of medicine. The interest, enthusiasm and honour with which some of these medical men were received and treated at royal and princely courts underlined the reputation European medicine had attained by the beginning of the seventeenth century. A good number of them visited India under a variety of circumstances, but the majority came to serve as doctors or surgeons in the factory establishments and other settlements that had sprung up in the coastal areas in the seventeenth and eighteenth century. By 1764, when the empire building act had already set in, the number of doctors and surgeons so increased as to call for the establishment of a medical service, first in Bengal and subsequently in the other two coastal provinces.

Early European Physicians and Surgeons in India

Early in the seventeenth century we hear of one George Strachan, Scottish by birth, who worked as a surgeon in an English factory established at Ispahan in 1616. From Persia he transferred his activities to India where he worked till the end of 1622.[1] John Clarke was probably the first surgeon to be engaged at the fort at Armagon in 1630 shortly after the establishment of English factories at Nizampatam, Masulipatam and Armagon on the Coromandel coast. The second half of the seventeenth century records a fairly large number of physicians and surgeons of whom the most important ones were Francois Bernier, Nicholas Manucci, Gabriel Boughton, and John Fryer. Francois Bernier (b. 1620) was educated at the old and reputed medical school at Montpelier and arrived in India (Surat) in 1658. He was soon engaged as personal physician to prince Dara Shikoh and travelled in various parts of India including a trip to Bengal in 1666. Bernier's contemporary Nicolas Manucci, of Venice, arrived in India in 1656 and practised medicine at Lahore, Madras and Pondicherry. Not much is known about his early medical training, but that he built up a good reputation as a physician is attested by his long medical practice extending over fifty years in India. In his *Storia do Mogor*, he mentioned a number of European medical men he met.[2] Gabriel Boughton, Surgeon of the Company's ship 'Hopewell' is well known for his legendary treatment of the daughter of Emperor Shah Jehan. The most distinguished of them all was John Fryer (b.c. 1650) who obtained from Cambridge his first medical degree in 1671 and arrived in Bombay in 1673. He spent a few years in Surat and in Persia and returned to England in 1682 to continue his medical studies and practice.

He was admitted to the M.D. degree of the Cambridge University and elected to the Fellowship of the Royal Society of London. He recorded his experiences in India and the East in the form of eight interesting letters, covering the period of his travels from 1672 to 1681.[3] In those days it was fashionable for the houses of princes and Nawabs to maintain European physicians. Nawab Muhammad Ali, for example, had eight European medical men, of whom three later on joined the Company's medical service at Madras. The Company's settlement at Madras generally maintained a good medical corps, from which Crawford retrieved the names and dates of twentythree surgeons.

From the very beginning the East India Company had developed the practice of sanctioning at least one medical officer for each of its permanent factories. In Bengal the Company's factories started appearing from 1620, first in Patna and subsequently in Hughli (1651), Kasimbazar (1659), Dacca (1668), Malda (1676) and other places. The early names of physicians and surgeons we get from these settlements are those of Edward Whiting in 1662, Ralph Harwar, surgeon in Hughli in 1672, John Plomer, surgeon in 1695, and William Warren, surgeon in Calcutta in the closing years of the seventeenth century. Apart from their indispensable professional services, these physicians and surgeons were not infrequently employed for diplomatic purposes. Gabriel Boughton's reputation as a physician made it easy for the English mission to obtain a farman from Emperor Shah Shuja. During John Surnam's embassy to Delhi between 1714 and 1717, surgeon William Hamilton played a similar role by successfully treating the king Farakh Siyar.

Royal Hospital at Goa

If the factors and trading companies, by their policy of having medical officers at the settlements, facilitated the arrival of physicians and surgeons from Europe, the Portuguese rulers of Goa contributed to the same movement by founding the Royal Hospital there shortly after their conquest of the island in 1510.[4] Moreover, the Royal Hospital had the distinction of first arranging for some sort of medical instruction after the European system. The hospital was described by a number of eminent travellers and physicians which included Mandelslo, Pyrard de Laval, John Fryer, Le Blanc and Tavernier.

John Albert de Mandelslo visited India during 1638-39 and wrote an account of his travels, which was translated into French by Abraham de Wicqueford and into English by John Davis in 1662.[5] Mandelslo described the hospital as a noble structure capable of accommodating one thousand patients and fully equipped to meet the requirements. At the time of his visit, there were "a large number of patients in the infirmary, most of them suffering from 'pox' or 'bloody flux'. Those whose life was despaired of were carried to a private room where each was attended by a priest who remained there till the end came."

Pyrard de Laval, a French seaman was cast away in an island, arrested by the Portuguese and shipped to Goa in 1608 for a three-week treatment at the Royal Hospital. Pyrard described the hospital as follows : "Viewing it from the outside we could hardly believe it was an hospital ; it seemed to us a grand palace, saving the inscription above the gate : *Hospitale dil Rey Nostro Seignoro.* The beds are beautifully shaped and lacquered with red varnish ; the sacking is of cotton ; the mattresses and coverlets are of silk or cotton, adorned with different patterns.... ; pillows of white calico.... Each patient served with a complete fowl, and the plates, bowls and dishes were of Chinese porcelain. In the evening they brought us supper at the appointed hour, to each a large fowl roasted, with some dessert, so we were astonished at the good cheer we received.... This hospital is, as I believe the finest in the world, whether for beauty of the building and its appurtenances, the accommodation being in all respects excellent, or for the perfect order, regulation and cleanliness observed, great care taken of the sick, and the supply of all comforts that can be wished for.... It is of very great extent, situated on the "banks of the river, and endowed by the Kings of Portugal with 25,000 perdos (Rs. 75,000), let alone the endowments and presents which it receives from the lords. This is a large revenue for the purpose in those parts seeing food is so cheap. ....It is managed and governed by the Jesuits, who appoint a Father to the post of Governor. Other officers are Portuguese, all men of quality and gentility ; as for the servants and slaves, they are Christian Indians.... There are physicians, surgeons and apothecaries, barbers and bleeders, who do nothing else, and are bound to visit each of the sick twice a day. The apothecary is one of the household, and lives in the hospital and has his shop well stocked at the hospital's expense.... The sick are sometimes very numerous, and while I was there, were as many as 1,500, all of them either Portuguese soldiers or men of other Christian races of Europe, of every profession and quality. Indians are not taken in there, having a hospital apart wherein are received only Christian Indians.... No women are allowed to enter, sick or sound. Nor are any householders received, neither men, women, nor children. This hospital is only for the *soldades,* that is for such as are not married or domiciled, but are soldiers of fortune."[6]

This is indeed a very graphic sketch of the set up as it existed in the early seventeenth century. To all intents and purposes it was a military hospital meant for Portuguese nationals, it followed racist policies to the fullest extent, and it was lavishly endowed to make living as comfortable as possible. As far as comforts and arrangements go, it was superior to the Hospital of the Holy Ghost in Rome or the Infirmary of the Knights of Malta, both most famous hospitals of Europe at the time. The only important point missing in this account is how good or effective the treatment was.

In the state of the medical art then obtaining this last point could not be very flattering indeed. Cholera, scurvy, enteric and venereal diseases for which no effective

or specific treatment was then known accounted for high mortality in the Hospital. In the course of a century Goa's population was reduced to one-tenth of what it had been in the middle of the sixteenth century. In the backward state of European medical science, bleeding of patients, as Fryer noted, used to be resorted to as often as thirty or forty times leading to frequent deaths. Tavernier visited the Hospital in 1614 and 1648 and noticed a striking fall in the standard of treatment during this thirtyfour years. Writing on the history of the Goa Medical School, Pacheco de Figuieredo stated that during the 16th-17th century Goa's sanitary conditions and public health so deteriorated that 'its large population of 400,000 inhabitants lacked hygiene and medical assistance and was decimated by deadly epidemics—one century later, in 1670, it was reduced to 40,000'. Between 1540 and 1600 ten viceroys and governors were claimed by death, and about twentyfive thousand soldiers died in the Royal Hospital in the course of only thirty years from 1602 to 1632. In an appeal dated December 8, 1687 Viceroy D. Cristovan de Souza stated these grim facts and requested the home government to send two or three masters for purposes of teaching 'physics to many of the natives, who are very quick-witted and have the gift of learning' .. 'so that the hospital would have many doctors to help cure the diseases of your Majesty's vassal.'[7] The appeal bore fruit. In the beginning of 1703 one Cipriano Valadares, presumably trained in medicine and surgery, arrived in Goa and started a rudimentary teaching course in medicine. This paved the way for the establishment in 1842 of the School of Medicine and Surgery in Goa.

School for Native Doctors

The practice of providing some kind of medical instructions to Indians attached to hospitals was also followed and developed by the East India Company. At Fort St. George a general military hospital was founded in 1679. Later on other military and civil hospitals were established. By 1787, when one 'native doctor' on the pay of a havildar was sanctioned for each battalion of sepoys, a good demand for native doctors in the army developed, and the general hospitals played no small part in training this type of hospital assistants. Later on this training programme ceased with the abolition of General Hospitals and, in the absence of any other facility for medical teaching, the standard of recruitment of native doctors in the army fell to an alarmingly low level. It was in these circumstances that the Medical Board conceived the idea of establishing a full-fledged institution solely for the purpose of training native doctors for the army, and submitted, in 1822, a proposal in this regard to the Governor-General in Council, which was readily approved. From the point of view of institutional teaching in medical sciences, the School for Native Doctors had the distinction of being the first of its type, being eventually merged into a still greater medical institution, the Calcutta Medical College.

James Jameson and the Foundation of the School

In their memorandum dated May 1, 1822 in which the idea of a school was first broached, the Medical Board summarized their reasons as follows [8]:

"The paucity and insufficiency of that very useful body, the Native Doctors, has been long matter of complaint in the Medical Department of the army..... In former times, little difficulty was experienced in procuring qualified persons of this class. The General Hospitals, which were then established in different parts of the country, afforded an excellent school of instruction, whence well-taught and experienced individuals could be at all times procured. The army was likewise then not nearly so extensive as it has since become, and the number of persons of this description required for its various establishments was comparatively inconsiderable.

"Of late years, the case has greatly altered. The General Hospitals have been abolished, and every part of the army has been largely augmented, so that the demand for Native Doctors has, by a peculiar fatality, increased as the means of supplying them have been cut off. After this discontinuance of the General Hospitals, there being no longer any regular place of instruction for persons of this description, it became necessary when they were wanted, to seek them wherever they could be found.... In this way, the Native Doctors entertained within the last few years, have been persons of a very inferior description to those attached to the service in former times....

"Perhaps, the case now under representation cannot be placed in a stronger light, than by stating the fact, that the only Native Doctors now procurable, are so inexperienced and ill qualified, as to make it a just matter of doubt, whether it would not be better to leave the sick to nature alone, than trust their lives to men so little capable of rightly treating them."

The Medical Board found the solution in the establishment of a school for the training of such doctors. "After much and anxious consideration of the subject," continued the memorandum, "it has appeared to the Medical Board, that the only means holding out a fair promise of remedying the evil, and of providing a numerous class of well trained and skilful persons to serve as Native Doctors, will be found in the Institution of a regular school for their education, and the nomination of a skilful medical officer to instruct them in the most necessary branches of medical knowledge.... It is proposed to establish at the Presidency a class of Native pupils whose number shall never fall short of twenty ; and whose vacancies be filled up as they occur." The memorandum also stated that the qualifications of the pupils to be selected for admission to the school should be the 'capability of reading and writing Hindustani in the Nagari or the Persian character and whose age does not exceed twenty years'.

The Board clearly realized that the success of a venture in professional education of this kind must depend upon the selection of a right type of superintending teacher. It was not enough for him to be an expert physician and surgeon. He must know the local languages in all their technicalities, and must be able to furnish the reading materials in languages the pupils understood. So the Board suggested that the business of the teacher should be 'to superintend the whole Establishment, and to direct and look after the small and practical pursuits of the pupils, to prepare manuals of the most necessary and intelligible parts of medical knowledge, in the native language, for their use, to deliver courses of lectures on the same subjects ; and generally to take every means of imparting to them a practical acquaintance with the diseases of most frequent occurrence in India, the remedies best suited to their cure, and the true mode of applying them'. Accordingly, the superintendent must be acquainted with the written and colloquial languages of the country, particularly the Persian and the Hindustani, be able to read and use indigenous systems of medicine. The diseases which afflict the Indians are not always the same as those from which the Europeans suffer. So it was thought imperative for the teacher to have had an extensive experience in the most prominent disorders of an Indian climate, and be well informed of their differences as they attacked the differently constituted frames of the European and the Indian.

Lieutenant Colonel Casement, Secretary to Government in the Military Department readily conveyed to the president and members of the Medical Board the Governor-General's approval of the proposal for setting up the school and asked for detailed arrangements in the form of regulations of the institution. The Government further suggested that Dr Jamesc n, the Secretary of the Board himself, about whose talents and zeal the Governor-General in Council entertained so favourable an opinion, might be considered for appointment. On May 30, 1822, the Board submitted the Regulations of the proposed school, and suggested that the salary of the head of the school 'should not fall short of Sicca Rupees Sixteen Hundred per mensem, in the case of his being selected for the exclusive performance of the duty, and of the half of that sum in the case of his being permitted to fulfil it in addition to any other medical appointment he may hold at the Presidency'.[9] Within less than a month the Military Department issued the Governor-General's general order No. 41 dated June 21, 1822, establishing the School for Native Doctors. Extracts from this order are given below :—

"I. That an institution be formed at the Presidency for the instruction of Natives in Medicine ; and that it be called the School for Native Doctors.

"2. The object of the Institution will be, to educate Native Doctors for the Civil and Military branches of the service.

"3. The Institution is to be placed under the Management and direction of a Medical Officer, to be denominated the Superintendent of the School for Native Doctors.

"4. The class composing this school, shall not, in the first instance, consist of less than twenty students ; vacancies in it are to be filled up as they occur.

"5. No person to be admitted a Student, who is not, at the time of his application, capable of reading and writing the Hindoostanee language in the Nagree or the Persian character ; and whose Age is under 18 or above 26 years.

"6. Hindoos and Moosulmans to be equally eligible, with the sole condition that they be persons of respectable cast and character ; and willing cheerfully to perform all the duties of their calling."

"8. The students are to be regularly enlisted as Soldiers ; from the time of their admission, they are to be supported at the expense of Government ; when duly qualified, to obtain Certificates from the Medical Board ; and are to succeed as Native Doctors on the occurrence of vacancies in the Army, or Civil Department. Their period of Enlisted Service will be 15 years from the time of leaving the Institution as Native Doctors, unless prevented serving so long, by disability, proved before a Medical Committee and certified accordingly. After a service of 15 years they may demand their discharge in time of peace.

"9. The duties of the Superintendent will embrace the whole Establishment ; he is to direct the Studies, practical, and general Conduct of the Students ;—to prepare Manuals of the most necessary and intelligible parts of Medical Science, for their use, in the Native Language ; to give demonstrations, and deliver Courses of Lectures to them on these subjects ; and generally to take every available means of imparting to them, a practical acquaintance with the diseases of most frequent occurrence in India ; the remedies best suited to their cure; and the proper mode of applying those remedies."

"12. The Superintendent will be entirely subject to the Orders of the Board in everything relating to the Welfare of the Institution and its Students ; and he is to be guided by their Advice and Instructions, in all cases of difficulty, or circumstances of emergency."

"18. The Students to be severally attached to the Presidency General Hospital, the King's Hospitals, the Native Hospital, (with the consent of the Governors) and the General Dispensary, as may be found most convenient, for the purpose of acquiring a practical knowledge of Pharmacy, Surgery, and Physic."

"21. The Students attached to the several European Hospitals will be placed particularly under the Apothecaries respectively belonging to those Hospitals, to attend the Hospitals Wards and Dispensary, and to assist in dressing the patients, in preparing and administering Medicines, and in the other ordinary duties of the Establishment.

Those attached to the Native Hospitals, to be placed under its officers ; and those attached to the General Dispensary under the Apothecary and his Deputy, and in like manner to assist in the duties of those Establishments."

"27. During the whole term of his Education, each Student will be supported at the Public charge, for which purpose, the Sum of Sonat Rupees Eight per Mensem will be allowed to him; this sum being deemed fully sufficient for his clothing and Maintenance. The allowance to commence from the date on which the pupil reports himself to the Secretary to the Medical Board."

"29. With a view to encouraging this important class of Public Servants ; of stimulating and rewarding superior attainments on their part ; and of permanently attaching them to the Public Service ; the Government have resolved that the pay of the Native Doctors educated at the Institution, shall be raised above the rates which have been hitherto ordinarily allowed to the same description of persons, viz. to Sonat Rupees 20 instead of 15 in Garrison or at Civil Station, and 25 instead of 20 in the Field ; and that, with the same view, the allowances of such individuals be still further advanced after seven years of service as Native Doctors, viz. to 25 Rupees in Garrison or at a Civil Station, and 30 Rupees in the Field ; provided the Medical Officer under whom the Native Doctor may be serving at the time, grants a certificate, that the general character, and professional conduct of the Individual, deserve this Indulgence. The certificate to be countersigned by the Superintending Surgeon of the Division."

"34. All Native Doctors educated at the Institution, and attached to Civil Stations, are liable to serve with the Army, when so ordered by Government, or by the Commander in Chief when his Excellency may happen to be in the Field, when the same advantages in every respect will be extended to them as to Native Doctors attached to Corps."

"36. The Salary of the Superintendent is fixed at Sonat Rupees Eight Hundred per Mensem ; with an Establishment of a Moonshee to assist in reading and translating at Sonat Rupees Sixty, a Writer at Thirty, and a Peon at 5 Rupees per Mensem."

"39. His Lordship in Council is pleased to appoint Surgeon James Jameson to the Office of Superintendent of the School for Native Doctors."

Clearly the order is a fairly complete document containing the aims and objects of the School, the duties, responsibilities and emoluments of the Superintendent, student matters including qualifications for admission, their maintenance allowances, hospital training facilities, and their employment prospects after qualifying as Native Doctors. While an appointment in a military or civil station was more or less guaranteed, garrison pay previously sanctioned to Native Doctors, was hardly sufficient to attract pupils to go through the rigours of a medical training. It is not surprising that the circulation of the general order, both in English and in Indian languages, elicited poor

response of which Jameson complained bitterly. One should also note the staggering disparity in the emoluments of the Superintendent and those of the munshi, writer and like subordinate staff, a disparity which characterized the Company's, and later on the imperial, rule as long as it lasted.

James Jameson, the chief architect of the plan and first superintendent of the school did not live to give the institution a proper start. He died in January 1823. During the few months he lived he tirelessly corresponded with the Superintending Surgeons of Divisions and other civil and military medical officers in order to obtain good candidates for admission to his school, prepared Bengali and Hindustani translations of the general order of June 21, 1822 for much wider circulation and dissemination of the school prospectus, and compiled a materia medica in Indian languages. Upon his death, the Medical Board invited applications, through Divisional Superintending Surgeons, for the post of Superintendent of the School. The records of the Medical Board refer to a number of applications,—from Drs W. Farquhar, George T. Urquhart, John Tytler and Peter Breton. Two more names e.g. Alexander Davidson and J. T. Royle (they did not apply) were also recommended from the divisions. As an instance of qualifications and experiences the surgeons and medical men trained in England then possessed the following excerpts from the applications of Farquhar and Urquhart may be interesting. Farquhar stated : "I studied four years at the University of Edinburgh, at which University I obtained a Surgeon's diploma and a Medical Degree. I afterwards passed as Surgeon in London, and served upwards of two years in His Majesty's 88th Regiment during about fifteen months of which period I acted as surgeon of the 1st Battalion,...."[10] Urquhart submitted : "After an apprenticeship of three years, under a Physician in extensive practice I attended the lectures of the Professors at the College, and the practical treatment of diseases in the Hospital at Edinburgh for a period of three years at the end of which time I passed the usual examinations and obtained a Degree as Physician. The following season I attended the lectures(on) Dissections and treatment of Diseases in Lieutt. Thomas and Grey's Hospital under the direction of the present Sir Asthy (Ashley ?) Cooper, and the late Mr Clive and was admitted a Member of the Royal College of Surgeons."[11] Peter Breton, Surgeon at the Ramgar Corps, Hazaribagh, in his letter of May 23, 1823, does not mention his bio-data, but informs that late Jameson had already offered to relinquish the situation in his favour if he would accept it. So Peter Breton who was already well-known to the Medical Board was appointed to the post of superintendent of the School of Native Doctors by the general order dated October 3, 1823, and the teaching and other academic activities of the School really started from that date. The case of John Tytler who succeeded Breton will be discussed in what follows.

Peter Breton

Peter Breton worked as superintendent for seven years till his death in 1830. During this period he prepared a vocabulary of medical terms in English, and local

languages, a Hindustani translation of the *London Pharmacopoeia,* and several small tracts forming the basis of his lectures regularly delivered to the pupils, and procured skeletons, surgical instruments and chemicals as aid to his instructions. He had already started work on the vocabulary before joining the school. This vocabulary was in the form of a table of names of the different parts of the human body and of diseases in English, Arabic, Persian, Hindi and Sanskrit and compiled 'with the assistance of intelligent natives'. In his plan of instruction submitted to the Board, Breton maintained that such a vocabulary would be of practical utility to the pupils and also to the Medical Department generally. The vocabulary was printed at the Government Lithographic Press and made available to the students and the Medical Department.

Breton took considerable pains in translating into local languages in Persian and Devanagari characters medical and anatomical discourses originally composed in English. A maulavi and a pandit were sanctioned to assist him in this work. These tracts which served the purposes of text-books were divided into different categories, e.g., anatomical, pharmaceutical, medical etc. The anatomical works included introductory lecture, osteology and descriptions of several visceras and organs such as thoracic viscera, abdominal viscera, brain and appendages, eye and appendages, ear and appendages, male generative organs, integuments. Pharmaceutical works included a treatise on materia medica, Hindi translation of *London Pharmacopoeia,* a treatise on the component parts of the air and a posological table. He composed medical tracts on cholera morbus, vegitable poisons and snake and serpents' venom and treatises on rheumatism, intermittent fever and topography of the celud promxies.[12] Copies of these tracts were produced at the Lithographic Press. Although these tracts involved hard labour and were useful in the absence of text-books, these could hardly be called text-books proper. His successor John Tytler, in his account of the school during Breton's tenure, criticized the treatises as follows:- "In the anatomical department it will be seen that we are without any description either of the muscles and Ligaments, Blood vessels, absorbents or nerves, the tract on Osteology is merely a catalogue of the names of the Bones unaccompanied by any description, the tracts on the Thoracic and Abdominal Viscera are too brief to afford much information and if I may express such an opinion the tracts on the minute anatomy of the Brain, Eye and Ear are hardly required in this Institution as yet. The Materia Medica mentioned in the Pharmaceutical Department is an account of the Bazar Medicines of Hindoostan compiled and translated by Doctor Jameson and the translation of the *London Pharmacopoeia,* at the same time that it contains a great deal with which it is unnecessary to burden the memory of the Pupils, is unfortunately destitute of any account of their properties or mode of employment.....the Medical and Surgical Catalogues....contain only detached parts of the science."[12] Tytler wrote these comments not to underestimate the work of Breton but to make out a case for improved text-books he proposed to write for his pupils.

Breton started his classes at his own residence as then there was no separate building with class rooms, museums and laboratories. Upon assuming charge he pleaded for such accommodation in a rented house both for holding classes and for the proper upkeep of demonstration materials. After registration the students used to be distributed at the General Hospital, King's Hospital, the Hon'ble Company's Dispensary and the Native Hospital. This arrangement then rotated among the students groups enabling each of them to have the experience of the four hospitals. About the lectures Breton reports : "Lectures in Hindoostanee are delivered to them on particular cases and on operations ; and Demonstrations of the Human Body are given as opportunities offer at the General and Native Hospitals. Lectures on comparative anatomy illustrative of the structure and functions of the various parts of the animal Body, and discourses on Materia Medica and Practice of Physic are also given to the students in the Superintendent's own Premises, and the substance of the lessons delivered in the Hindoostanee Language are written in the Persian and Nagree character by the Moonshee and Pundit attached to the School, assisted by my own private Persian and Nagree writers and are subsequently printed in Lithography for the instructions of the Students and the Native Practitioners of Hindoostan."[13]

In the pharmacy class, various experiments were shown including preparations of different substances such as sulphate of soda, magnesia, muriatic and nitric acids, calomel, hyd. precip. rubrum, caustic bougies, spirits of wine from rice and goor, and distilling the same. 'The calomel was prepared by a very simple process, and although it is not so white as Europe calomel, it is equally efficacious, for I have tried it satisfactorily on three patients, and it stands the test of lime water. This will prove an admirable resource to native doctors in any part of the country when the stock of Europe calomel may be expended.' Nitric acid was prepared by another simple process employing *kusus* (sulphate of iron) instead of sulphuric acid which was not procurable in large quantities. The pupils were involved in all these pharmaceutical and chemical preparations. When not engaged in these practical works, they read pharmacopoeia and Ramsay's Hindustani Materia Medica. Breton found this method very helpful in developing understanding of the various processes. He also demonstrated to the pupils a variety of experiments with the air-pump and on electricity with the object of giving them some idea on the properties of air and the phenomenon of lightning. In the medical class, Breton followed another method. When the students assembled at his residence at night (from 8 to 10 p.m.), he made the senior boys describe the various organs from memory while two of his assistants demonstrated the component parts of the brain, viscera, bowels, and eye. This exercise was followed by questions and answers and the reading of medical tracts. In this way their minds were exercised to enable them to recollect what they saw and learnt.

Breton also introduced the system of monitors and assistants. According to this system all the trained students of the school should not be made available, after

qualification, for appointment as native doctors. Four of the most capable students should be permanently attached to the school as monitors and assistants on the same emoluments as those of native doctors. These persons were to assist the Superintendent and take some load off his shoulders. Their main duties would be 'to teach the elementary part of medical science to the junior students'.

Breton reported that the students prosecuted their studies with zeal and diligence even in the least attainable part, e.g. anatomy. No practice or procedure calculated to contribute to the preservation of human lives was considered repugnant to the tenets of their religion even by the Hindu students. The boys regularly attended the hospitals and readily assisted the surgeons in dissecting human bodies whenever opportunities presented themselves. "The majority of the students who arrived in Calcutta in 1823', wrote Breton, 'can themselves give a clear Demonstration of the thoracic and abdominal viscera, of the Brain, of the Bones, and of the structure of the Eye, and have distinct notions of other parts of medical science which have been explained to them." Furthermore, "For the short period they have been in the Institution the progress they have made is really very satisfactory, and I have no hesitation in saying that they already knew as much of anatomy and medicine as the generality of the medical students in England (who have not had the advantage of seeing Hospital Practice and of attending public lectures) do after the completion of their apprenticeship."[13] The period of instructions after which a student could be certified as a qualified doctor had not yet been decided. From his experience Breton thought that between three and four years should be sufficient for the students to be fully qualified for any kind of duty that could be allotted to a native doctor. By 1826 eight of the students were already appointed to the army and four of the best informed as assistant teachers in the permanent establishment of the school.

Although European system of medicine was taught at the school, Breton was alive to the importance of the native system which contained useful remedies. "In teaching the students Anatomy and Medicine according to the European system", Breton stated, "it is not intended that they should be wholly excluded from the advantages derivable from the native Practice. Many native Remedies are probably superior to those of Europe, and possibly only require to be made known to English Professional men to be rendered extensively beneficial."[14] In this connection he mentioned the operational skill of one Sautcouree who was expert in the removal of cataract. Obviously he was not acquainted with the structure of the eye, but he could perform the delicate operation dexterously and with success. He performed such an operation on Mr J. B. Birch, Justice of the Peace and restored his eye sight. Breton himself had the opportunity of seeing the person carry out his operations on the cataract both in his residence and at the General Hospital and examine the eyes of the patients after the operation. "From these cases", he observed, "and from my conviction that Sautcouree has operated on a

number of cataract patients (probably several hundred, since he has practised as an oculist in Calcutta for the last 25 years) I am disposed to believe from the astonishing simplicity of the operation and the little liability to accidents to the Eye in the introduction of the couching Needle he uses which has neither a point nor cutting edges, that his mode of couching is easier and safer for the natives of India (whose Hands are generally unsteady) to adopt than the European method which required skill and perfect steadiness of hand to ensure success."[14] Sautcouree was also skilled in performing operations for the dropsy, hydrocele, spleen etc. In fact, Breton was so impressed by Sautcouree's skill and method that he engaged him in his private service to teach his pupils his method. Five of his pupils who acted as monitors received the training and practised the art, during the training period, upon the eyes of sheep and goats. One of them, Pursun Singh, performed the operation successfully on the cataract in the left eyes of two old men in Breton's house and restored their sight. Breton wrote a small tract entitled 'On the Native Mode of Couching' (1826).

As teaching aids human skeletons, dissecting instruments and other appliances arrived from England. He also got, with the permission of the Medical Board, dissecting and tooth instruments, lancets and chemicals from the Hon'ble Company's Dispensary. "I have further to beg," applied Breton to the Board on April 26, 1827, "a small supply of Carbonate of Potash and Epsom Salts (say two pounds of each) to show the students of what the latter is composed and the mode of obtaining Magnesia, also a small quantity of Materials for making Bouzies, and a small supply (say 8 ounces) of Sulphuric, Muriatic and Nitric acids."

The following is the list of 18 students trained by Breton, who were appointed to positions of native doctors at various stations :

Name	*Date of appointment*	*Place where appointed*
1. Pursaud Singh	March 1, 1831	Saugor
2. Shaikh Peer Bux	Do	Do
3. Gunga Pursaud Digit	Do	Cawnpore
4. Shaikh Ahmud	Do	Barrackpore
5. Yakoob Alee Khar	Do	Do
6. Gunga Pursaud Tewaree	Do	Do
7. Meer Reaze Allee	Do	Do
8. Shaikh Tegh Allee	Do	Meerutt
9. Shaikh Muskeen	Do	Do
10. Guneas Pursaud	Do	Bhaugulpore
11. Shaikh Enaet Hoseen	Sept. 2, 1831	Governor General Household

12. Runjeen Nyn Doss	Oct. 8, 1831	Governor General Household
13. Meer Kasim Allee	Aug. 28, 1831	Ramree
14. Causee Pursaud	Oct. 19, 1831	Asstt. Surgeon to the Commander-in-Chief
15. Shaikh Hedaet Allee	Oct. 22, 1831	Lunatic Asylum
16. Buldoo Tewaree	Nov. 15, 1831	Balasore
17. Shaikh Wahud Allee	Nov. 15, 1831	Ramree
18. Rung Loll	Dec. 14, 1831	Elauah

John Tytler

John Tytler, Breton's successor in the school was an able, interesting and controversial man. He was trained as a physician and mathematician, learned Arabic and developed a great interest in oriental sciences and learning. His oriental learning inevitably brought him to the centre of the controversy between the anglicists and the orientalists in the course of which he valiantly defended the cause of orientalism. In his application for the position of Superintendent of the School for Native Doctors, following Jameson's death, he emphasized his acquaintance with the Arabic language by referring to his papers in the *Asiatick Researches* as follows: "I know not whether it be regularly official for me with much respect to refer the Board on this subject to the 13th volume of the *Asiatick Researches* at the 461 page, of which there will be found the translation of a passage of Arabic performed by me *unassisted* and should it be thought worthwhile for the Board to take so much trouble in examining the qualifications of an Individual, it will be found that on the 13th December 1821 the Hon'ble Mr Adam condescends to present to the Asiatic Society an Essay of my composition containing a larger portion of Arabic likewise translated by me *without assistance,* and with many Apologies for its apparent but unavoidable ostentation."[15] Tytler also translated a voluminous Persian compilation on mathematics without the help of a munshi ; he also considered such help useless because of 'the general and deplorable ignorance on all scientific subjects' on the part of such munshis.

At the time of his application Tytler was an Assistant Surgeon in the garrison at Monghyr and was therefore a qualified medical man. He did not dwell on his medical experience except referring to his work 'as a dresser for twelve months under the late Sir James Earl' at the Bartholomaus' Hospital and to his possession of 'a complete set of anatomical and surgical Lectures of Mr Avernethy together with the greatest part if not all of those of the Medical and Chemical Lectures' delivered at the said hospital. Interestingly enough he compiled these lecture notes in short-hand writing in which he developed a good proficiency and specially mentioned this as the notes were likely to be of great help to a superintendent of a medical school. While in Monghyr, he worked

for sometime as a subordinate superintendent of vaccination and prepared a memorandum on the benefits of vaccination in local languages for circulation among the people.

Upon assuming charge Tytler prepared a report of the School (he generally called it the Native Medical Institution) for 1830 covering the last year of Breton's superintendence. We have already referred to his criticism of the tracts and treatises prepared by his predecessor. But he also noticed that the School needed reforms in many other aspects. The pupils selected for admission were generally of poor quality and had inadequate preliminary education required for assimilating medical instructions. Teaching was faulty as no attempt was made to instruct the pupils in the essentials of medical science. He deplored the want of a definite and well thought out syllabus and of books and reading materials. He set out to remove these defects and concentrated on the improvement of the teaching and the preparation of tracts and text-books. While in the former he did not meet with any difficulty, the preparation and translation of text-books and their publications, for which the approval and clearance of the Medical Board were necessary at every step, landed him into arguments and counter-arguments with the Board frequently leading to protracted correspondence. All these were fully documented in his report for the year 1831 he submitted to the Board under his letter dated April 11, 1831 which covered 51 pages of the proceedings.[16]

The pupils generally picked up their knowledge and experience through long association with the hospitals and dispensaries. In this way, they learnt 'the names, doses and properties of the medicines there employed, and the more intelligent could point out the treatment of some common diseases. These circumstances....and the habits of attention and observation they had acquired rendered them greatly preferable to the former class of Native Doctors who were destitute of these advantages'. But they developed hardly any acquaintance with the principles of medical science. Being gifted with a strong memory, they tried to memorize a large quantity of names and information in a foreign language without developing a capacity 'to reflect upon and understand what they have thus acquired or to derive from it ideas of practical utility.' To remedy these defects, two things were necessary : 'first to establish a systematic mode of teaching, second to compile better Tracts.'

Mode of Teaching. To improve upon teaching Tytler introduced four classes, the fourth being the lowest class and the first the highest. The lowest class began with anatomy, the third class with materia medica, the second with practice of physic, and the first surgery. To the beginners in the 4th class he taught anatomy in the following manner : "After a preliminary Lecture I begin with bones and commencing as usual with the head go regularly through the whole, pointing out their processes and foramina, the attachment of muscles and the passage of vessels and nerves,—all this on real bones, separate and connected ; after this I exhibit the soft parts in a similar manner on the bodies of sheep beginning with the Viscera of the Thorax, then the Abdomen, the Pelvis

and Brain and organs of sense. I finish by showing the course of the principal Blood Vessels and names and during the whole demonstrate the principal muscles; in all this I exhibit as far as possible the objects themselves. The Viscera of the Throax are so alike in warm blooded animals that for them a sheep is as useful as a human subject; so are those of the Abdomen and Pelvis excepting what are strictly chylopoietic but there are frequent opportunities of seeing these in Post Mortem examinations at the General Hospital. The difference in the Vessels and nerves is so slight as to occasion no difficulty, and in the mascular structure the only difference of consequence is in the hands and feet which are comparatively of little moment. Throughout the whole course I point out the Physiology, of the different organs and the most interesting facts connected with their diseases and occasionally notice the difference of structures and functions in man and animals. This is useful as giving clear ideas, impressing the facts on the memory and making attention to a multitude of objects devoid of interest to those who look at them carelessly but capable of affording valuable instruction to more attentive observers."

Tytler also elaborated upon his method of examining the pupils. Here his object was to ascertain how much they remembered and understood of what he had taught them. Thus he would at random pick up a bone and ask the pupils to state each process and foramen, and the muscles, vessels and nerves connected with it. On the subject of the anatomy of the living subject he caused the students to 'point out in their own bodies the place of each organ discoverable externally. 'Thus I cause them to point out', he reported, 'the Zygoma, mastoid Process, Acromian Coracoid Process, Spine of the Ilium Trochanter Major and to give a reason why other processes are indistinguishable'.

Chemistry. In his lectures on pharmacy to the third class, Tytler laid emphasis on the study of chemistry which formed the basis of this branch of medical science. His chemistry lectures were intended to impart to the boys an idea of the essential principles, e.g., the three states of aggregation, specific gravity, the effects of sensible and latent heat, the laws of affinity, and principal gases connected with pharmacy such as oxygen, hydrogen, carbon azote, chlorine and phosphoric acid. After this initiation into chemistry he introduced the subject of medicines commonly employed in hospitals, 'giving an account of their sensible and medicinal properties, the diseases in which they are employed, their doses and the medicines with which each is incompatible'. For testing the pupils' knowledge he used to exhibit small specimens of several similar articles together like calomel, tartarized antimony, antimonial powder, magnesia and oxymuriate of mercury or otherwise powder of rhubarb, bark gentian jalap etc. and ask them to identify each and tell its composition, property and dose. Previously there was no instruction in chemistry at the School nor any reading material on the subject. Tytler compiled a large work on the first principles of chemistry, covering the topics of his lecture, but we do not find any record as to whether the work was developed in a form suitable for publication.

His lectures on the practice of physic and surgery were similarly detailed but no further information was given except the statement : 'similar methods are followed with the 2nd or Medical and 1st or Surgical class, in which I require them to explain the symptoms and treatment of each disease and performance of each operation'.

Prospectus of the School. In order to enable the students to derive the maximum benefit from these lectures Tytler suggested certain minimum qualifications for the entrants, a definite course of study, and other means of teaching. He called these the prospects of the Institution. In the early days when the students were not readily attracted to the School, the needs for preliminary qualification could have been and were indeed ignored. But as its advantages were appreciated and more students applied for admission than there was room for, the necessity of admitting indifferent candidates who were unable to read except with much difficulty and blundering, could not put into writing any information given to them, and sometimes failed to count correctly up to 100, did not exist. The desirable qualifications should include age, education and health. The age should be between 16 and 22, previous education should be insisted upon, and sickly candidates rejected.

Course of Study. The sciences that should constitute the course of study, Tytler maintained, should include anatomy, chemistry, pharmacy, medicine and surgery. On each one of these sciences the highest intellect of Europe had been labouring for centuries, and to attain even a tolerable proficiency in any one required the devoted attention of a life time. Therefore, all that could be attempted in the course of two and half years, the usual period allowed for the training of native doctors, was 'to take a limited portion of such parts of the above sciences as are most useful for the purposes of Government, to impress that thoroughly in the minds of the Pupils and omit everything else not merely as superfluous....' Tytler offered to prepare a synopsis of the course of studies in such circumstances. "I would therefore respectfully solicit," he wrote, "that I should be allowed to draw up a synopsis of what the pupils are to learn in each of the Departments of Anatomy, Pharmacy, Medicine, and Surgery; nothing of this kind at present exists and the whole plan of education is consequently indefinite. The synopsis after submission to Government might be considered part of the regulations of the School and distributed among the Pupils...."

Dissection. Tytler was fully alive to the importance of dissection in any practical course of medical studies. In fact, he considered it as the foundation of anatomical and medical knowledge. But its introduction was rendered virtually impossible by the climate and habits of the people. Accordingly zootomy, that is, dissection upon animals was resorted to. When Tytler joined the School the pupils had nothing to do with dissection except examining the intestines of morbid subjects, and consequently 'had no notion of it as a means of acquiring knowledge'. On one occasion the students expressed

surprise when Tytler proposed to exhibit a sheep's heart and wondered how the human heart could resemble the sheep's. After the students were satisfied with the resemblance, this type of demonstration work based on animal dissections considerably increased, and Tytler submitted a request that 'one of the pupils trained for the purpose should remain permanently in the School under the title of dissector and with rank and pay of a Teacher'. About the growing interest in dissection, he cited an interesting incident. At one time he was very much in want of a subject to exhibit the membranes of the brain, but failed to procure a fresh head. Soon after Durshun Lall, a Hindu pupil brought him a skull his friend had picked up in the banks of the river. The skull was much injured and in a putrid state but sufficient of the Dura mater had remained to enable exhibition of its processes. Although a trifling matter, the incident showed that for the sake of learning and proper understanding the boys could get over their long standing prejudices about touching dead bodies. This was the beginning. Within a few years and under more favourable circumstances the boys started practising human dissections in the medical colleges.

Tracts. Tytler's second major reform concerned the compilation of better tracts and reading materials for the pupils. These tracts, he maintained, were one of the most powerful means for diffusing and perpetuating knowledge among the natives. 'European surgeons with the energies of their climate and the advantage of Books find it difficult to keep up a remembrance of all parts of their education'. In the case of Indian pupils, it was easy to understand 'that with whatever knowledge they leave this Institution unless they can refresh their memories it will speedily be obliterated and even whilst in the Institution unless the teacher have class book which they can read along with him and study in private his efforts must be grievously obstructed.' With this in mind Tytler prepared the following tracts :—

1. *Introduction to Materia Medica*—37 Pages; this dealt with pharmacopoeia containing as much of the principles of chemistry as would enable the pupils to understand the composition of medicines;

2. *Account of the most useful articles of the Materia Medica*—178 pages; contained names, properties, and doses of medicines usually employed in hospitals;

3. *A System of Osteology*—69 pages; comprehending descriptions of all the bones in the skeleton, their processes, foramina, attachment of muscles, ligaments, passage of blood vessels, nerves etc.;

4. *Account of Abdominal and Respiratory Muscles*—9 pages;

5. *Account of the Vascular System*—41 pages; revised and enlarged on the suggestions of the Medical Board;

6. *Tract on Gun shot Wounds*—6 pages; revised and enlarged according to the wishes of the Board;

7. *An account of surgical operations—On injuries of the Head*—14 pages; *on Hernia*—36 pages.

8. Miscellaneous papers—short answers to questions relating to amputation, dysentery, pneumonia, enterites, etc.

9. A list of all the medicines and instruments used in hospitals written in corresponding columns in English, Persian, and Nagari to enable the students to read and write lebels.

The maulavi and the pandit engaged by Breton did not possess qualifications good enough for assisting Tytler in the preparation of treatises of this nature. The maulavi, for example, had some knowledge of Arabic, but did not know Arabic medical terms, nor did he know any Arabic medical work or author. The pandit's Sanskrit was equally defective. So both of them were discharged, and in their place Hakim Abdool Mujeed, a learned Unani physician of Calcutta and Madhusudan Gupta, the medical pandit of the Sanskrit College were engaged. Tytler also consulted Maulavi Abdool Raheem, Persian translator in the Government.

It appears that the tracts prepared by Tytler, unlike those by Jameson and Breton, were more critically examined and studied by the Medical Board. The Board's comments and suggestions for the improvement of the manuscripts sometimes created bitter controversies and generated considerable irritation clearly evident in the proceedings. In connection with his draft on the circulation of blood in the foetus, the Board pointed out certain deficiencies in the following language: "In the first place you say the umbilical cord is composed of one vein two arteries and membrane etc. which membrane contains peculiar fluid. This the Board apprehend should.... (illegible) filled with a gelatinous substance. 2d. you state that the umbilical meeting with the left Branch of the vena Portie forms one....(illegible) which proceeding to the Lower is one large....Branches which latter going to the substance of the same are united to other veins so as to produce....This does not appear to the Board to be sufficiently clear and explicit when it is considered for whose instruction the treatise is required....'[17] Tytler revised the portion pointed out and submitted a revised draft.

With regard to his translation of the account of the arteries, veins and absorbents in his tract on vascular system, Tytler stated that the tract had been compiled from the best anatomical authorities within his reach. On going through the manuscript, the Board remarked: "They have marked in pencil one or two trifling alteration which they recommend to your notice. They are likewise of opinion that the tract might be rendered more complete and useful were you to interperse it with a few cursory practical remarks on the subject of the relative situation of the vessels in the Thigh, Arm and

Neck as connected with the operations for aneurism, the relative situation of the vessels passing over the Brain of the Pelvis and particularly that of the Artery to the Symphesis Pabis and anterior superior spinous Process of the Iliam with a view to its compression when required and finally on the course of the Epigastric artery so far as that is connected with the different operations for Hernia."[18] Tytler carried out the alterations, but differed on certain points with the Board's recommendation and wrote as follows:"..... I respectfully take the liberty to state that I cannot with propriety recommend the publication of this appendix for the following reasons. The tract on the vascular system is required for the youngest class who are beginning the study of anatomy which must necessarily be the commencement of their Education. To them the account of the complicated operations for aneurism and Hernia must necessarily be unintelligible and will serve to distract and perplex. In the next place as no system of anatomy has yet been compiled for the Pupils it is necessary to explain fully each particular organ whether nerve muscle Fascia etc. as it is mentioned and this renders the tract so irregular and unsystematic so to be very unfit for the Institution and lastly the anatomy in many places too minute for them to comprehend with our present opportunities. I could not however render it more general without risk of its being condemned as incomplete or incorrect."[19]

The above excerpts are enough to indicate the nature of transactions Tytler had with the Medical Board on the subject of medical tracts intended for use in the class. If the differences between the author and the Board may at times appear exasperating they also reflect the keen interest and enthusiasm of the Board in the novel experiment of developing medical education among the Indian youth. The work involved enormous labour. Apart from the intellectual labour of original composition in English and subsequent translation in Persian and Hindustani, six to eight transcriptions of each tract had to be made mostly by Tytler himself in the absence of a writers' cell. To these were added the more troublesome work of revision, additions and alterations and consequent retranscriptions of the entire set. In the process some of the tracts no doubt gained in more factual wealth and lucidity of expression. As a specimen of Tytler's tracts, the following extracts from the first chapter entitled 'Of the Arteries' of his vascular system are reproduced :

"OF THE ARTERIES"

"Arteries are pulsating vessels which diminish in size as they recede from the heart but so, that of the branches proceeding from a trunk each branch is smaller than its trunk but all the branches together are greater than the trunk. The arteries arise from the Ventricles of the heart. They sometimes terminate by uniting with the terminations of the veins and sometimes they become exhalent vessels and sometimes the

end of one artery united with that of another and this union is called anastomosis. Its use is that if one of the anastomosing Vessels should be tied or cut the part. . . .may be nourished by the other. Arteries have three coats : the external, middle and internal. The external coat is composed of elastic cellular membrane, the middle coat is mascular its fibres being disposed in the form of ring. The internal coat is delicate and polished. The power of the middle or mascular coat is small in the large arteries and great in the small arteries for the large arteries being near the heart its action is sufficient to propel the blood through them. On the other hand the small arteries being distant from the heart, its power cannot reach to them. The Elastic power is contrary to this. It is greater in the large arteries and small in the lesser. On this account that the blood from the heart strikes with great force against the large arteries which give way ; were this not the case they would be injured by the constant impulse. Another use of the elasticity is, that of an artery be divided its mouth will contract and it will retreat itself into the surrounding flesh by the presence of which the bleeding will be stopped. The use of the arteries is to transmit blood to all parts of the body for their nourishment for the maintenance of natural heat and the production of the various secretions. The blood in the large arteries flows swiftly that in the small slowly. The nourishment of the large arteries themselves is from small arteries destined for this purpose which ramify upon the sides of the large arteries. They are called *vase vasorum.*"

During the next three years the activities of the School continued along lines outlined for 1831. The number of students varied between 50 to 70. Each year some new tracts appeared in print. Tytler continued producing translations of new tracts on various subjects e.g., in anatomy, a full account of the viscera of the abdomen and of the membraneous system; in surgery, an account of the treatment and operation for fistula in ano, and of the fumigation of ships and hospitals to destroy the foul air ; and in medicine, enlargement of his account of fevers, by including phrenites, pneumonia, neurites, gastrites, hepatites, nephrites, cystites, apoplexy etc. Elegant anatomical models arrived from London. Towards the end of 1833 the Government appointed a committee with Dr J. Grant as President, for the purpose of examining, and reporting on, the state of native medical education. This committee visited the school several times and obtained from the Superintendent answers to a number of questions. New ideas were coming up on the educational horizon suggesting fundamental changes in the very approach to native education, both general as well as professional.

Medical Class of the Calcutta Sanskrit College

Breton's success in organizing medical classes at the School for Native Doctors inspired similar efforts at least in two other institutions, namely the Calcutta Sanskrit College and the Calcutta Madrassa. In June 1826 the General Committee of Public

Instruction received applications from the Secretaries of the Sanskrit College and the Madrassa Committee, requesting the Government to establish medical classes at their respective colleges.

Captain W. Price, Secretary of the Sanskrit College informed the General Committee that six students of the college and twelve individuals of Vaidya caste, not attached to the institution, prayed for 'the establishment of a medical class as affording them the means of obtaining medical Instruction, and gaining a livelihood when they shall have completed their studies in the College."[20] The General Committee agreed to the proposal, and the class was subsequently formed and placed under the charge of Dr Tytler. Āyurvedic medical work, particularly the *Suśruta*-and *Caraka-Saṃhitās* were used as text-books and European medical system was not excluded from the course. Later on when the College had an English class in addition to the oriental department, the European system of medicine was taught in the former and the Āyurvedic system in the latter. For the English class some of the text-books used included Hooper's *Anatomists' Vade-mecum, Physicians' Vade-mecum* and *Surgeons' Vade-mecum,* Thomson's *Conspectus of the Pharmacopoeia,* Fyfe's *Manual of Chemistry,* and Conquest's *Outline of Midwifery.*[21] Some of the tracts written for the students of the School for Native Doctors were also used. Furthermore, these tracts were also translated into Sanskrit and Bengali ; Pandit Madhusudan Gupta was granted a sum of Rs. 1000/- as honorarium for translating Hooper's *Anatomists' Vade-mecum.*[22]

From the report dated February 7, 1828, we learn that the Secretary of the College, W. Price, himself delivered anatomy lectures with the help of 'the Bengali translation of an English treatise on anatomy'. Tytler also demonstrated to the boys the bones of the human skeleton and some of the soft parts of animals. Later on J. Grant was appointed Anatomical Medical Lecturer and Superintendent of the Hospital attached to the College, of which we shall speak more presently. In the annual examination of the medical class of that year, conducted by H. H. Wilson, the students' performance was reasonably satisfactory as the following remarks would indicate : "The knowledge of the skeleton acquired by at least half the class is amply sufficient for all practical purposes not only the outline and number of the bones being correctly detailed but the principal projecting points and openings and the parts attached to them or passing through them being described. Of the soft parts the pupils are most familiar with the Brain and nerves having had an opportunity of inspecting them in an animal dissected by Mr Tytler. They are also familiar with the general course of the circulation of the blood and fully understand the difference between arteries and veins as well as the position of the great trunks of either. The construction of the heart is also known to them as well as site and offices of the viscera of the chest and abdomen. When the information thus obtained is impressed by repeated inspection the Pupils will be prepared to understand the functions of the body both in health and disease and to acquire

rational principles of medical treatment. They profess a strong desire to become Master of our whole Medical system and from what they have effected in anatomy it is fair to infer they will not be slow to benefit by instruction in other branches of Medical study of a less repulsive description."[23] Four years later Wilson noticed, in a communication to the Government, that the pupils of the medical class displayed considerable knowledge of anatomy and some acquaintance with European practice. Some of the young men educated at the College established themselves in practice amongst the natives, and some found appointment in the civil surgeoncy and in the hospital attached to the College. In January 1834, Tytler and Bramley examined the English medical class and noted that the students had read the greatest part of Hooper's *Anatomists' Vade-mecum* and *Surgeons' Vade-mecum* and learnt well. Their deficiencies were due to the absence of human dissection, which precluded them from entering the higher branches of medico-chirurgical knowledge.

It is of interest to note that the anatomical lecture room of the College was designed and fitted up in accordance with the advice of Tytler. In a memorandum dated December 10, 1828, Price solicited the sanction of the General Committee for the purchase of the following furniture :

A Teakwood Almira 8×4ft. with lock and key complete	..	..	70—
A Bookcase 9×4	..	,,	30—
4 Square Teapoys @ 5/-	..	,,	20—
6 Toon wood arm chairs @ 5/-	..	,,	30—
4 Teakwood School Benches 8×13 ft. @ 10/-	..	,,	40—
A Punka 12 ft.	..	,,	15—
A Cast iron Furnace & Boilers, Ladles, Tongs and Hammer &c.	..	,,	16—
	Sicca ..	Rs.	221—

Hospital. Towards the end of 1831 a small hospital was established for the treatment of patients as also for clinical instructions of the students. In the class room the students were doing fairly well with elementary anatomy and physiology as far as the means of the College permitted. Although the senior class had attended a course of lectures in the practice of physic, 'it soon became obvious that mere dry details, without direct personal reference to the phenomena of disease at the bed side of the sick could make but a very fleeting impression on the minds of the Student'. In short, a hospital of some kind was thought absolutely necessary for proper medical teaching.[24]

The moving spirit behind the establishment of the hospital was Ramcomul Sen who from the very inception took a keen interest in the development of the medical class. The hospital was planned on the cheapest possible scale, with a capacity for

Table 4.1. *Return of the Hospital attached to the Sanskrit College for the year ended December* 31, 1832.[25]

Diseases	House Patients				Out Patients			
	Admitted during the year	Discharged	Died	Remaining on Dec. 31 1832	Admitted during the year	Discharged cured	Died	Remaining on Dec, 31 1832
1	2	3	4	5	6	7	8	9
Abscess	1	1						
Accident	2	1		1	9	9		
Anomalous	6	6			12	12		
Apoplexy	2	2						
Bubo					1	1		
Carbuncle					1	1		
Cardialgia	2	1		1				
Colic					5	5		
Constipation					6	6		
Contusion	1	1						
Cystitis	1	1						
Cholera	1	1						
Debility					2	2		
Diarrhoea	1	1			4	4		
Diseased joint	3	3						
Dislocation					1	1		
Dropsy	3	3						
Dysentery	11	8	3		5	5		
Dyspnoea	1	1						
Fever	11	9	1	1	18	18		
Furnuculus					6	6		
Gastrodynea					4	4		
Glut					2	2		
Hamorrhoids					2	2		
Hepatitis	1	1						
Hemiplegea	1	1						
Hernia					1	1		
Herps					1	1		
Hydrocele	1	1						
Lumbago	2	2			2	2		
Odema					1	1		
Opthalmia	1	1			5	5		
Dulegmon					10	10		
Paralysis	1	1						
Prora					3	3		
Pulmonic affection	1	1			2	2		
Rheumatism	18	16	2	2	8	8		
Spleen	8	8			7	7		
Ulcer	5	5			26	24		2
Venereal	9	8		1	2	2		
Wounds					2	2		
Total :	94	84	6	6	158	156	—	2

accommodating thirty house patients. Nava Krishna Gupta, the senior and most advanced student of the medical class was appointed Apothecary, and he was assisted by one of the other students by rotation each month. Both of them had to live in the premises of the hospital night and day. This plan enabled all the students to have, by rotation, the much needed clinical experience. The hospital return for the year ended December 31, 1832 is given in Table 4.1.

The house patients slept and were dieted in the hospital, while the out patients presented themselves at the hospital when able and were prescribed for. The number of cases dealt with was indeed small for a hospital, but adequate for purposes of clinical instructions. There were several minor operations and mechanical processes very important for the surgical students. Thus the students had an opportunity of observing and even of partly carrying out in the presence of the superintendent processes of bleeding, passing the catheter paracenteses (tupping), the opening of little abscesses, the dressing of sores and cuts and the proper application of rollers and bandages. "There have occurred also good opportunities", Grant wrote, "of inculcating lessons in the practice of physic and of showing the effects of European remedies coming under the various heads of Laxatives, purgatives, Emetics, Tonics, astringents, Resolvents, Anodynee etc which have had the beneficial result of inspiring the minds of the alumni with the greater confidence in European remedies the more they came to (think) about them ; so that they often prefer these for themselves or friends for whom I am frequently consulted...." "By means of a little Hospital," he concluded, "the lessons acquired in the lecture room and in books are better understood and remembered and the students acquire at the bed side of the sick (in the immediate vicinity of the lecture room) habits of observation, of studying symptoms, of forming conclusions and of presenting readily. It is in fact an indispensable part of their systems of Education." It is evident that, although the original intention was to instruct the boys in the Āyurvedic system of medicine without excluding the European system, the latter gradually and inevitably gained in importance under European superintendence.

Medical Class of the Calcutta Madrassa

The case of the Calcutta Madrassa was different. Medicine, more correctly Unani medicine, constituted one of the subjects of study at the institution. Formerly, there were two posts, one for teaching medicine and the other for looking after the health of the students, and both the posts were held by Abdool Mujeed. In 1824 he was discharged on account of indifferent service, and the medical class was temporarily suspended. On June 13, 1826 D. Ruddell, Secretary of the Madrassa Committee wrote to the General Committee of Public Instruction, with a request to revive the posts of medical teacher and medical attendant of the students. Maulavi Zoolfukhur Alee was recommended for appointment to these two posts of 'Hakim and Lecturer of Medicine

on a salary of one hundred Rupees per mensem'. Zoolfukhur worked for sometime under Breton 'to assist him in preparing translations of medical works into the native languages for the use of the Native Medical Institution." In recommending his name to Ruddell, Breton stated : "But Zoolfukhur Alee has one advantage over his Professional Brethren, in having witnessed the system and plan of teaching adopted in the Native Medical Institution from having assisted me several months in drawing up in Hindoostanee Medical Tracts for the use of the Natives. Understanding the system I pursue, he can whenever he pleases, make use of any of my works (for they shall always be accessible to him) for the tuition of his Medical Class,...." Zoolfukhur Alee was appointed to the post on June 30, 1826 and more or less followed Breton's method at the Madrassa.

The following year Breton examined the first batch of students of the medical class and gave a favourable report.[26]

Introductory Discourse on Anatomy

"Insuf Alee—Answered very well such questions as were put to him.

"Samar Alee—Gave apt replies, and explained the meaning of the Anatomical Terms used

"On the Structure of the eye

"Kadim Kasyn
"Azeemabadu } Replied very well to such questions as were put to him.

"Umur Oollah—Answered readily

"Koorban Alee—Ditto

* * * * *

"Abdulu Baree—Answered extremely well and collected the parts of the animal Eye that had been shown him on the Instant."

* * * * *

"On the Cholera Morbus

"Kadim Kasyn—Seem to have acquired some knowledge of the nature of the Malady and described the symptoms with tolerable accuracy. Gave also very good reasons for supposing the cholera to be free from infection.

"Abdool Uheed—Gave a tolerable account of the Malady according to the descriptions given of it by English authors.

"Zynool Abideen—Gave accurate replies to questions on this singular Malady, and afforded proofs that he had read with attention the Treatise on the Diseases.

"*On Rheumatism*

"Gholam Qulundur—Is not so well acquainted with the nature of this Malady as he might have been.

"Islam Ullee—Appears to have read with attention the Treatise on this Disorder, and is beginning to form correct notions of its nature.

"Imdad Alee—Comprehends the subject tolerably well. Gave apt replies to Questions put to him.

"Juffur Alee—Has evidently read with attention the Treatise on Rheumatism, and has formed a fair notion of the nature of the Malady. Its symptoms he accurately described."

The working of the medical class during 1833 was examined by Tytler. Initially the desire for medical instruction was very limited. By 1833 the situation had somewhat changed, and the number of students had risen to 20 ; of these 12 were learning from Arabic medical works and the remainder from the Hindustani translation of Hooper's *Vade-mecum*.[27] In other words, one group learnt the Unani system and the other opted for the European system. Some of the Arabic works studied included *Shuruh Asbab, Aksurace,* the *Sudeedee* and the *Kanooncheh ;* the Hindustani translation of Hooper's *Anatomists' Vade-mecum* was entitled *Anees-ool-mosharra-heen.*[28]

Committee on the State of Medical Education

We have already mentioned that towards the end of 1833 the Government appointed a Committee to examine, and report upon, the state of medical education in the country. The Committee was composed of J. Grant as President and J. C. C. Sutherland, C. E. Trevelyan, Thomas Spens, Ramcomul Sen and M. J. Bramley as members. According to the directions of the Governor-General in Council, the Committee called upon Tytler to prepare a synopsis of what he conceived the pupils at the School for Native Doctors should be taught in the different branches of medical science. In March 1834 he received a similar request from Major Troyer, Secretary to the Committee of the Government Sanskrit College. Troyer desired Tytler's opinion as to whether it would be expedient to confine the medical instruction of the Sanskrit College to English lectures, and to adopt for class books solely English treatises upon anatomy and medicine, discarding Sanskrit books altogether. Simply speaking, it was the question of teaching European system of medicine to the exclusion of indigenous systems.

These communications and questionnaires produced strong and immediate reactions in the mind of the orientalist who had developed a love and respect for Sanskrit and Arabic literature in science. He opened his reply to Troyer by saying, "I do not consider myself as yet sufficiently conversant with Sanskrit medical Literature

to be justified in recommending a measure so important to the College as that of the abolition of the Sanskrit medical class nor do I suppose any individual in the world is so, unless perhaps the late Secretary to the Committee of Public Instruction. At the same time I trust the Committee will permit me as a lover of Science and Literature to say that to recommend the extinction of any species of them under whatever form may appear, is so repugnant to all my ideas that I should consider myself in some degree approaching to the barbarians of the ancient Goths and Vandals were I to do so and I respectfully trust the Committee will not seriously contemplate a measure which would be likely to cause the loss of many invaluable monuments of ancient learning and be classed by every cultivator of Learning as an injury to the world of the same kind as the irreparable destruction of the Alexandrian Library."[29]

Apart from cultural damage which the abolition of the indigenous systems foreshadowed, Tytler adduced a number of cogent arguments against such a measure. The Sanskrit medical class had already opened an employment avenue to the Vaidyas which would be closed. There were at that time about 50 students who were then learning Sanskrit 'for no other purpose but to be able to read Sanskrit medical Books;' this potentiality would grow with time and the proposed measure would seek to nip it in the bud. Then he raised the more basic question of the relative merits of the Āyurvedic system vis-a-vis the European. Tytler himself studied portions of Sanskrit medical texts, and translated a few chapters from the *Suśruta Saṃhitā*, of which a few samples had been earlier communicated to Troyer in connection with his examination of the Sanskrit medical class in January 1834.[30] He maintained that the Āyurvedic medical works contained a good deal that was valuable. "An error in medical theory", he wrote, "does not necessarily imply an error in medical practice. The practice of the Sanskrit Physicians may in many cases be right though some of their doctrines be wrong and as medicine at the best is but a conjectural science, it can never be certain that an European Physician will always prescribe more judiciously or successfully than a Sanskrit Vaidya and under these circumstances it may not be unreasonable for a native to prefer being treated in his own way by his own countrymen..... In proof of this I am told from the best authority that of all the students, who have left the College after being instructed in European Medicine not one practiced among his countrymen by its principles or remedies except on very rare occasions."

As to learning medical science from English books Tytler expressed grave doubts whether this would at all be possible with the students' imperfect and partial acquaintance with the English language. A few individuals who studied at the college might 'gain a faint glimpse of the simplest routine of European practice but to their countrymen European medical Science must remain for ever unknown'. While some of these arguments were debatable, and the Committee was by no means convinced of them as we shall presently see, his argument about the supply of European medicines was

irrefutable. The success of European therapeutics, it need hardly be overemphasized, depended upon the supply of European medicines. This supply was limited to cities and a few important places and was already inadequate for these places; if the entire population were to depend on European practice and medicine, there must be established an apothecary's shop in every village to dispense medicines at such a price as the villagers can afford to buy. "It is plain," he urgued, "that all the stores of the Honorable Company ten times counted, would not supply the wants of a tenth part of the population." Furthermore, "there is little chance that any revolution of circumstances will make such an article as Quinine much cheaper than it is now, in vain then will a native practitioner prescribe such medicines if his patients be unable to pay for them." Drugs and medicines prescribed by the Āyurvedic and Unani practitioners were, however, available in every bazar at a price people can afford to pay. He further observed that these native drugs better suited native constitution, and the native materia medica contained many useful and efficacious drugs which European practitioners were not yet aware of. So the introduction of the European system and the abolition of the indigenous one would mean the progressive decline of the latter and consequent ruin of the indigenous drug and medicine industry. This coupled with the perpetual shortage of European medicines was likely to bring about a disastrous situation. Tytler ended up with a highly ethical note: "European Science like the Christian Religion has by far the best chance of succeeding among the natives of Hindoostan by our avoiding every appearance of coercion and allowing and even encouraging them to study their own system and our together and quietly make the comparison themselves. We thus prove that we have no jealousy of their knowledge, we incline all their national feelings in our favour and give their understandings full room to act. Under these circumstances if they are reasonable creatures truth must at least, however, slowly make its way among them and be permanent. I am therefore decidedly of opinion that it would be inexpedient to abolish the Sanskrit medical class."

Regarding the School for Native Doctors, the problem did not centre round what system of medicine should be taught. The European system of medicine and surgery had already been adopted by the School from the very beginning. Here the main problem concerned books and other reading materials and the medium of instruction. Because of the nature of selection of students mainly from the families of army personnel, their inadequate educational background and very deficient acquaintance with English, medical books, tracts and other reading materials had to be compiled in local languages. This translation activity and the compilation in Indian languages, with all the shortcomings of translation of technical subjects, constituted the main bottleneck. Could this bottleneck be removed by straight away introducing English as the medium of instruction and English medical books and tracts as reading materials ? Tytler doubted that a system of educating the natives through the medium of English would in any way be more comprehensive than one using the native languages as media of instruction.

He argued that English was one of the most difficult of all languages and the most diversified in its origin. It arose from three sources,—Saxon, Latin and Norman—French; hence a correct knowledge of it could be obtained only by a certain degree of knowledge of all the originals. The Committee agreed that 'for the attainment of a hypercritical or highly scholastic knowledge, such as is not possessed by one Englishman out of a hundred, Mr. Tytler's position may be readily acceeded to', and then asked, 'Will a native sub-assistant surgeon be the less capable of being taught to amputate a limb, because he cannot give the critical etymology of the words *knife, limb, cut*?' In another place, Tytler tried to explain the difficulties of teaching English language to the Indian students and the imperfect result of such attempts. "The great sources of our language must be shown; the Saxon, the Latin, and the French. We must explain what words and what idioms are derived from each, and what changes they have undergone in their passage. Till this be all done, difficult as it may seem, we may by much practice impress upon the natives a sort of jargon, and agree to call it English; but it will bear scarcely more resemblance to real English than to the dialect of Hottentots". To this the Committee replied equally pungently : "In a word, if we do not make lexicographers of native sub-assistant surgeons, they will not be able to set a fracture, or to prescribe a dose of calomel; and their English remarks or directions, though perfectly intelligible, will amount, in fact, to nothing but a Hottentot jargon. Need we, in refutation of this exaggerated view, remind your Lordship, that there are many respectable native gentlemen in Calcutta, who both speak and write English correctly and fluently?....and at this moment there are three newspapers in Calcutta printed in the English language, and yet edited by natives?"

The Committee was so obviously annoyed with Tytler's lengthy arguments and adverse comments that at one stage of their report they observed : "The determined orientalist having himself acquired the Sanskrit and the Arabic, at the cost of much and severe application, as well as of pecuniary expense, will view with great repugnance a suggestion of teaching science in such a way as may cast his peculiar pursuits into the shade, and independent of a language which he reveres as classical." This was a personal fling least deserving of a respectable Committee charged with the task of finding honestly and truthfully the real state of affairs in an important area of professional education.

On the important question of the medium of instruction the Committee had also obtained the views, among others, of Reverend Duff, the confirmed anglicist. Duff unhesitatingly replied:"The experience of the last three years has, if possible, confirmed the conviction he previously entertained, not merely that it is possible to teach native boys the principles of any science through the medium of the English language, but that, in the present incipient state of native improvement, it is next to impossible to teach them successfully the principles of any science through any other medium than

the English." Duff further advocated: "The English language opens up a whole world of new ideas, and examples of success in every department of science; and the ideas so true, and the examples so striking, work mightily on the susceptible minds of native youth; so that by the time they have acquired a mastery over the English language, under judicious and enlightened instructors, their minds are almost metamorphosed into the texture and cast of European youth...."

The Committee's mind was already made up. The Committee recommended 'that the best mode of fulfilling the great ends under consideration, is for the State to found a Medical College for the education of natives.' In this college should be taught the various branches of medical science cultivated in Europe, and on the approved European system. The intending candidates should possess a reading and writing knowledge of the English language, similar knowledge of Bengali and Hindustani, and a proficiency in arithmetic. 'A knowledge of the English language', the Committee again emphasized, 'we consider as a *sine qua non*, because that language combines within itself the circle of all sciences, and incalculable, wealth of printed words and illustrations; circumstances that give it obvious advantages over the oriental languages, in which are only to be found the crudest elements of science, or the most irrational substitutes for it.'[31]

This recommendation, soon followed by Macaulay's minute and Bentinck's resolution, sealed the fate of the School for Native Doctors and the medical classes at the two leading oriental institutions of Calcutta. The School was then incurring an annual recurring expenditure of Rs. 33,960/-. The Sanskrit College was spending Rs. 5,472/- on the salary of Dr. Grant (Rs. 300/- p.m.), Madhusudan Gupta (Rs. 60/- p.m.) and 12 scholarships (Rs. 96/- per mensem). The estimate for the Madrassa was not given. The proposed new College which appeared in their place ushered in a new chapter in medical education and determined the direction of future development.

Training in Surveying

In the field of technical education, the Government's attention was first drawn to the need for training Indian youths in modern methods of surveying. In Madras there existed a small surveying school in association with the astronomical observatory from around 1795. In Bengal the Government was at first definitely against teaching surveying of any kind to young Indians because of the military and political implications of such survey work. As a precaution against reliable maps falling into the hands of the French, the Dutch and other rival powers then operating in India, the Court of Directors of the East India Company insisted on the secrecy of maps and surveys and restricted the art of surveying to their own covenanted officers and military personnel.[32]

Civil surveying for revenue purposes stood on a different footing although more or less the same technics were employed. Moreover, revenue surveying was an ancient process well established in the country, and there was a class of people called the *amins* or *mirdhas* who were specialized in the art. Between 1803 and 1808 Thomas Munro employed such class of people to carry out successfully a revenue survey of the ceded districts. After 1815 the Government in Bengal relaxed their old taboo about the employment of Indians in survey work and decided to encourage the training of Indian youths. This decision also coincided with the proposals to undertake extensive revenue surveys in the Upper Provinces.

Training under Surveyor-General and individual Surveyors

The Bengal Government had no previous experience of employing Indian youth for such work. So they approached the Madras Government and the survey establishment there to advise them in the matter of setting up 'an establishment for the instruction of boys in the principles of geometry, mensuration, and drawing, with a view to the employment of them as land surveyors.' After requisite training the land surveyors would be called upon to carry out accurate survey of districts for permanent settlement of revenues and geographical and statistical information that may be needed from time to time. Colonel Mackenzie who was then in Madras and to whom the matter was referred readily agreed to send a few trained surveyors to Bengal. In 1818 Mackenzie moved up to Bengal and brought with him three experienced surveyors,—William Scott, usher at the Surveying School with many years' experience, Henry Hamilton and Marcellus Burke, surveyors, and three draughtsmen Newman, Mustie and Gould. Three apprentices, 'bound for seven years', were also brought from Madras. Scott undertook the training of the apprentices, while Hamilton assumed charge of the drawing office. Burke was set off to Cuttack for survey work. Nothing much came out of this effort.

In the meantime there were stray reports of European surveyors occasionally training Indians in the art and successful performance by such trainees. Thus three apprentices from the Kidderpore Orphan School were sent to work under Gerard in the Upper Doab. Three other boys from the same school were apprenticed to Morrison then doing survey work in the Sunderbans. Morrison, in his communications, gave an account of the nature of the training these boys received from him. "They have been instructed in the most useful branches of surveying.... *viz.* plain trigonometry, for ascertaining the heights and aistdnces of objects—mensuration for laying down an estate—route and river surveying—the observing—the working of the latitude, either by the sun or a star—keeping the rate of a chronometer by observations and calculating the difference of longitude therefrom—to reduce or increase a map in copying it—to find the variation in the compass—they can also write and print the names of places in maps very neatly."[33] Morrison recommended these boys for employment in survey work involving the use of optical instruments like sextant.

Hodgson who likewise trained several apprentices remarked of them: "When the young men born in this country have received a complete education, they make very good surveying assistants, draughtsmen, and copyists, and if the revenue surveys are executed a door will be open for the employment of many of this class of persons... A number of promising lads might be selected from the Orphan Schools and apprenticed to Government or perhaps to the Surveyor General....I think that if twenty boys could be selected and trained .... it might be an advisable measure."[34]

In 1829, by which time the whole subcontinent was open to survey for which formidable task cheap Indian labour was indispensable, Bentinck had to acknowledge: "It is by a more enlarged employment of native agency that the business of Government will be at once more cheaply and efficiently transacted." Under this policy the surveyors took a more lively interest in the training of Indian surveyors and a few of them even started survey schools. The training was organized under the apprentice system, and the *amins, mirdhas* and *mutsuddis* already involved in land work were generally preferred for apprenticeship in the Upper Provinces. The trained *mirdhas,* for example, apart from their service in land surveying and accounting, 'would be of much use to the Judge and Magistrate in deciding on cases of disputed property. Fraser and Brown, in Upper Provinces (Saharanpur), ran a survey school with such ends in view. In one session, Brown entertained six young pupils, taught them surveying, and succeeded within a short time in teaching them how to write accounts in English figures, to keep field books in the useful form and to survey with the circumferentor. At the end of the training the boys were put to a practical test. Bedford, another enthusiastic surveyor, similarly organized a training programme during his survey work of the Moradabad Cantonments.

Gradually the idea spread beyond the Government establishments and the small circle of surveyors. As the prospects of employment brightened the educational institutions started thinking seriously about introducing a course of surveying in their general curriculum. The Hindu School showed the way and in time produced young Radhanath Sikdar who came to lime light in connection with his computation of the height of Mt. Everest. Other schools followed suit. All these developments, however, belonged to a future period.

Agricultural Education

If John Mack was the first teacher in chemistry in this country, William Carey was the first teacher in agricultural science, botany and forestry. Carey imbibed his interest in gardening and horticulture from his uncle. His biographer wrote :"The youth whose gardener uncle would have had him followed that calling....became a scientific observer from the day he landed at Calcutta, an agricultural reformer from the year he first built a wooden farm house in the jungle...."[35]

While at Mudnabatty at Dinajpur, superintending an indigo plantation work, carey had an opportunity of studying at first hand the primitive conditions of agriculture in this country. The results of his study and his own ideas on bringing about a reform in the current practice of agriculture were set forth in an article in the *Asiatick Researches* in 1808.[36] He noticed the poor soil management, the extreme poverty of the people, wretched farming equipments, the primitive irrigation methods (he called them 'watering with the foot'), and the modes of ploughing and reaping, —all contributing to a low yield. Some of these practices were illustrated with lithographed figures. The principal crops were treated in considerable detail and in a lucid language so as to attract the attention of the Government, a language 'which it would have been well to remember or reproduce in the subsequent avoidable famines of Orissa and North Bihar.' His discussion of other cultivated plants included indigo (in which he was an expert), hemp, jute, wheat and oil seeds. No less important were his paragraphs on the conservation of forest resources, a subject on which the Government did not wake up till 1846. "The cultivation of timber,' he wrote, 'has hitherto, I believe, been wholly neglected. Several sorts have been planted ....all over Bengal and would soon furnish a very large share of the timber used in the country .... In some situations sal .... would prosper. Indeed the improvements that might be made in this country by the planting of timber can scarcely be calculated."

Carey's interest in plant science found further scope of development after he settled down at Serampore. Here on a five acre plot of land he laid out a botanical garden and planted many exotic trees on the Linnean system. From Bhutan and the foothills of the Himalayas he collected many obscure varieties. With Roxburgh, then superintendent of the Company's Botanical Garden at Sibpur he was on excellent terms and often exchanged plants for purposes of transplantation and acclimatization. Carey's garden at Serampore, rich with mahogany and deodar, the teak and tamarind, the carob and eucalyptus and other rare trees previously unknown in Lower Bengal, became in the early part of the nineteenth century almost as important as the Sibpur Botanical Garden. Around the garden he developed the study of botany and delivered lectures on the subject at the College and at public meetings as we know from the recollections of his son Jonathan.[37]

The educational aspects of agricultural science received a more direct impetus from the foundation of the Agri-Horticultural Society in 1820. Here again Carey was the driving spirit. On April, 15, 1820 he issued a *Prospectus of an Agricultural and Horticultural Society in India,*[38] inviting European and Indian gentlemen to become its members and lend strength to the Society in its task of popularizing scientific agriculture. "Both in forming such a society and in subsequently promoting its objects, important to the happiness of the country as they regard them, the writer and his colleagues will be happy in doing all their other avocations will permit. .... It is

particularly desirable that native gentlemen should be eligible as members of the Society, because one of its chief objects will be the improvement of their estates and of the peasantry which reside thereon." At the first formal meeting held on September 14, 1820, the constitution of the Society drawn up more or less after the prospectus was adopted. Between 1820 and 1885 the Society's membership increased from a few European and Indian gentlemen to over five thousand with many nationalities. Its success was so conspicuous that it was followed as a model for the establishment in 1838 of the Royal Agricultural Society of England.

The Society had planned to publish its *Transactions* regularly in English, Bengali, and Hindustani. The *Transactions,* one of the earliest periodical publications (after the *Asiatick Researches*) contained special articles on various aspects of agriculture, tea and forestry. These articles were, however, intended for educated specialists. For the general public it arranged agricultural exhibitions, sometimes exhibiting popular European dairy products and vegetables, prepared and grown in the country. Carey's head gardener exhibited on the occasion in the Town Hall the English variety (Covent Garden) of cabbage and became famous overnight. The making of Warwickshire cheese was another remarkable achievement. The Society supplied, often free of charge, improved seeds to its members as well as non-members on request. By means of these exhibitions, at which prizes were liberally bestowed, the Society succeeded in creating a good deal of interest among the local cultivators around Calcutta. To this mainly, wrote Firminger, 'was due the abundant supply of remarkably fine vegetables that may be seen in the markets there during the cold months.'[39] The Society's *Proceedings* dated January 9, 1828 record that in one of the exhibitions, Goluk Chundra, a blacksmith of Titaghar showed a steam engine made by himself without the aid of an European mechanic. This steam engine was fabricated for developing powered irrigation. Goluk obviously got the idea of applying steam engine to irrigation from the example of the missionaries who had used a similar engine for working a paper mill at Serampore. The following years about 109 malis exhibited vegetables produced in machine-irrigated lands. A premium of Rs. 50/- was presented to the innovating mechanic.

The Agri-Horticultural Society also established several branch societies in different parts of India, notably at Cuttack, Bhagalpur, Lucknow, Delhi, and Lahore. Like the parent body, these branch societies encouraged the formation of public gardens, organized agri-horticultural shows, distributed seeds and plants, and helped promote better agricultural practices in various other ways. Later on, when agriculture as a subject came to be taught in some schools and attachment of gardens was recommended as an important feature of school buildings, the society was the only expert body to advise the school authorities in these matters.

Notes and References

[1]Buchanan, 422.

[2]*Storia do Mogor* or *Mogul India*, 1653-1706, translated and edited by W. Irvine, Indian Text Series, London, 1907-8.

[3]Fryer, John, *A New Account of East India and Persia, in eight letters, Being nine years travels, Begun 1672. and finished 1681, London. 1698*, edited by William Crooke for Hakluyt Society, 1893; in 2 vols., 1909-1912.

[4]Neelameghan, 52-56.

[5]*Voyage and Travels of J. A. Mandelslo into the East Indies*, rendered into English by J. Davis of Kidwelly, London. 1662 ; 1669.

[6]Quoted by Neelameghan from *The Voyage of Francois Pyrard, of Laval, to the East Indies, the Maldives, the Moluccas and Brazil*, translated by A. Gray, Hakluyt Society, 1887.

[7]Neelameghan, 56, The quotation is from Pacheco de Figueiredo, J. M. *Anais de Instituto de Medicina Tropical*, Numero especial, vol. XV, suppl. No. 1. Sep. 1958,p. 327.

[8]The memorandum was signed by Dr Gillman, Dr Meik, Dr Russell and Dr James Jameson, Secretary to the Medical Board and forwarded by the Secretary to Lieut. Colonel Casement, Secretary to Government in the Military Department under letter dated May 9, 1822, *PMB*, National Archives, New Delhi.

[9]Letter dated 30th May, 1822, *PMB* ,National Archives, New Delhi.

[10]Letter dated 15th February 1823 from J. Mac Dowell, Superintending Surgeon, Berhampore to John Crawford, Secretary to the Medical Board, enclosing a letter dated 14th February1823 from W. Farquhar to James Mac Dowell, Superintending Surgeon, Berhampore, *PMB*, National Archives, New Delhi.

[11]Letter dated 26th February 1823 from R.Keys, Office of Superintending Surgeon (record book erroneously wrote 'Engineer , Kurnaul Circle, Meerutt Division of the Army to Crawford, giving extract of application from Doctor Urquhart, *PMB*, National Archives, New Delhi.

[12]The list of treatises prepared by Breton was appended to John Tytler's letter dated March 30, 1831 to James Hutchinson, Secretary of the Medical Board, *PMB*, National Archives, New Delhi.

[13]Letter dated April 20, 1826 from P. Breton to Dr. Adam, Secretary of the Medical Board, giving an account of the work of the School for Native Doctors, *PMB*, National Archives, New Delhi.

[14]Letter dated October 14, 1824 from P. Breton to George Proctor, *PMB*, National Archives, New Delhi.

[15]Letter dated April 28, 1823 from John Tytler, Asstt. Surgeon, Garrison, Monghyr to G. Proctor, Secretary, Medical Board, *PMB*, National Archives, New Delhi. The paper referred to was entitled 'Essay on the Binomial Theorem; as known to the Arabs', *AR*, **13**, 456-466, 1820.

[16]Letter dated April 11, 1832 from Tytler to James Hutchinson, *PMB*, National Archives, New Delhi. Here Tytler is referred to as Superintendent of the Native Medical Institution.

[17]Letter dated May 31, 1831 from James Hutchinson to John Tytler in reply to the latter's letter dated May 24, 1831, *PMB*, National Archives, New Delhi.

[18]Letter dated January 31, 1832 from James Hutchinson to John Tytler, *PMB*, National Archives, New Delhi,

[19]Letter dated May 21, 1832 from J. Tytler to James Hutchinson, *PMB*, National Archives, New Delhi.

[20]Letter dated June 5, 1826 from W. Price, Secretary of the Sanskrit College to the General Committee of Public Instruction, *Minute Book of the Sanskrit College*.

[21]*Centenary of Medical College, Bengal*, 4, F.N.

[22]Letter dated May 20, 1834 from Mr J.C.C. Sutherland, Secretary, General Committee of Public Instruction to Capt. A. Troyer, Secretary, Sanskrit College, *PGCPI*, West Bengal State Archives.

[23]Report dated February 7, 1828 of W. Price re : Annual Examination for the year, submitted to the Subcommittee of the Hindu College, *Minute Book of the Sanskrit College*.

[24]Letter dated January 7, 1833 from J. Grant, Superintendent to Major Troyer, Secretary to the Sanskrit College giving an account of the hospital attached to the College, *Minute Book of the Sanskrit College*.

[25]Appended to J. Grant's letter dated January 1,1833.

[26]Letter dated Januay 25, 1827 from P. Breton to Captain Ruddell, *PGCPI*, West Bengal State Archives.

[27]Kerr, 82.

[28] Eatwell, 17.

[29]Letter dated April 3, 1834 from John Tytler to Major Troyer, *Minute Book of the Sanskrit College*.

[30]Translation of a portion of the *Suśruta Saṃhitā* by John Tytler, ommunicated to Troyer under Tytler's letter dated January 29, 1834. This could be possibly the earliest translation of part of the *Suśruta Saṃhitā* and is reproduced here :

"Translation of two chapters of the First Part of the Soosroota" (by John Tytler):

CHAPTER FOURTH

"Now here we shall explain the chapter of conversation to him who has attained the reading but has not expounded it according to the sense. It is like a load of Sandal Wood upon an ass it is merely a cause of fatiguer. Here is also (a stanza).

"As an ass bearing a bundle of Sandal Wood has a knowledge of its being a load not of its being Sandal Wood, so indeed, they who having read many Shastras are yet ignorant of their meaning carry (their knowledge) like asses.—

"On this account (in these 120 chapters) every word, foot, verse, half verse is to be elucidated and to be heard, on which account (the following things) are subtle, Substance, Taste, Quality, Strength, assimilation, Humours, Elements, Foesces, Viscera, Organs, nerves, Tendons, Joints, bones, the formation of the foetus, the partition of things (which are) assembled together, then the taking out of extraneous bodies concealed in the body, the ascertaining of inflammation, the distinction of fractures, the curable, alleviable or incurable nature of diseases and also other miscellaneous objects these being considered a thousand times, may produce confusion in the intellect even of a person of pure and large understanding what (will it do) again with a person of little understanding. Hence it is necessary that each word each foot, *śloka* and half *śloka* is to be described and be attended to. Of those occurring matters which are objects of other Shastras and which are introduced here through necessity the explanation is to be heard from learned men because it is not indeed possible to make one Shastra comprise all Shastras. Here there are verses, a reader of one Shastra only will certainly not understand that Shastra. Hence that Physician only who has heard many Shastras can well understand that Physician who having received the Shastra uttered from the mouth of his Gooroo and having studied it frequently, practises he is a (real) Physician others indeed are robbers. The books are called "Oupadhenava", "Ourabhra Saushuta Pauskalavata".... these are the roots of the other Shastras of Surgery: let (the Physician) study them."

CHAPTER FIFTH

"Now here we shall explain the preliminary collection of Instruments. There are three kinds of operation, the preliminary operation, the chief operation, the concluding operation. We shall explain these according to every disease. In this Shastra, on account of the importance of cutting operations we shall first explain cutting operations and the things necessary for them. Now here cutting operations are of eight kinds, namely Cutting, Dividing, Scarification, piercing, Exploring (foreign bodies lodged in the body), Extracting the same, evacuating matter, (and) stiching (wounds). Now by a physi an desirous of performing any operation first these things are to be collected viz. Instruments, Knives, caustics, Fire, Probes, Cupping Glasses, Leeches, Gourds, Cauterizing needles, Cotton, Rages, Threads, leaves, Silk, Honey, Ghee, Fat, Milk, Oil, Delicate food, Decoctions, Plasters, Extracts, Fans, cold and hot water, boiling pots, etcetera and also assistants attentive, steady and strong. Then in an auspicious lunar day and lunar half day and hour and mansion of the moon and having worshipped Fire the Brahmins and the Physicians by milk, by whole rice, by drink and by jewels having caused the diseased persons to sit with his face to the east and having restrained himself, he (the diseased person) having made and a proper examination of the mantras and having eaten light food, then the Physician having his face to the east and avoiding the vital parts, the nerves, sinews, joints, bones, canals, let him introduce the knife regularly, according as matter is visible. At once let him lift up the knife quickly. But in large abscesses two fingers or three fingers are the extent for the knife. Then thus Large, of equable surface well circumscribed these are the good qualities of abscesses. There is a Stanza. Extensive; large well rcumscribed not connected (with any vital part) having found a good time the abscess (with those properties) is fit for operations. Boldness, quickness in work, sharpness of knives, want of the perspiration, of trembling and or ignorance in Physician (all this) is fit for an operation.

"And one inflammation being uncured (the Physician) having perceived (this) by his internal perception let him make another inflammation (by counter irritation). There is a verse. Whenever a Physician may know a fistula and whenever also there exists a deep ulcer, there let him make a (contra irritative) inflammation then the disease will not remain.

"Now an oblique incision is directed (to be made) in the Eyebrow, the cheek, the temple, the forehead, the eye lid, the lips, the Gums, the armpit, the abdomen and the groin; wise (Physician) may cause, make a lunar or solar incision (circular) in the hands and feet and a semilunar form also in the arms and Penis."

[81]For the extract from the Report of the Committee, *vide* Trevelyan, Appendix.
[82]Phillimore, I, 286; II, 354; III, 388.
[83]Phillimore, III, 361.
[84]Phillimore, III, 362.
[85]Smith, 298.
[86]Carey, 1-26.
[87]Smith, 306. See also Ghosh, 218-25.
[88]The Prospectus was later on printed in the *Transactions of the Agri-Horticultural Society*, I, 1837.
[89]Firminger, 4.