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THE AWADH SCIENTIFIC RENAISSANCE AND THE ROLE OF THE FRENCH: C. 1750-1820

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INTRODUCTION

The features that characterise the Awadh rulers of Lucknow, Faizabad and allied places, become interesting to the historians as parameters for intellectual change. The flexibility is found in their methods of control over the agrarian-craft-commercial base, which had sustained the Mughal Empire for two hundred years, and also enabled its regionalised elite to become more rational, technically interventionist, and thus became capable of diverting the vast resources of the empire towards the building of their regional dominions and administrative capitals.[1]

As regards scientific and technological skills of the Mughals, it may be said that ever since the First Battle of Panipat (1526), Bābur had played the role of a technical innovator by introducing the tactical use of cannon in a battlefield. His deployment of artillery with greater mobility made it more influential in battlefields that had till then been dominated by the cavalry - a military technical innovation that won for him the North Indian Empire. To end his dependence on foreign gun suppliers, Babur also introduced into India the skills of his Rumi guncaster Ustad Ali Quli. Babur wrote about science and technology in his Memiors (the *Bāburnāme*) and this massive tome is one of the most valuable literary sources on the history of the local crafts and craftsmen, agriculture, and irrigation techniques prevalent across sixteenth century northern India.[2]

In the same vein, Humāyūn, his successor, was challenged and removed from the position of the ruler of Delhi by a technically superior leader, an Afghan named Sher Shāh Sūrī - whose kingly authority depended mostly on performance in the field of battle and in his skills as a law-enforcer. Sher Shāh during his brief occupancy, managed to put in place the elements of a revenue system that lasted well into the 18th

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After the paper had been received, the author was cruelly assassinated. The paper deals with an important theme, hence it is published.

century. He was also capable enough to cut a major road through the heart of imperial north India that linked Lahore to Patna and Bengal.

Emperor Humāyūn nurtured science too. The ousted Mughal, recaptured Delhi in 1555 and his passion for astronomy and books led him to his death because he fell while coming down from his Observatory in January 1556. An encyclopaedia written in his honour was perhaps the best science book to come out of the Mughal court, viz. the *Jawahār ul 'Ulūm i Humāyūnī* of Mohd. Fazil Samarqandi.[3] This was a massive tome meant to instruct the emperor in all the sciences as well as in some essential techniques. This encyclopaedia too is being mined for reconstructing the history of medieval Indian technology and science. Another such encyclopaedia written for the emperor was the *Jawaharnāmā* of Mohammad Ashraf bin Asad Rustamdari in which metals, their alloys along with their compositions were described and minerals were identified.[4]

His son Akbar, rightly the most famous Mughal emperor, was also a technically savvy ruler who made it a point to visit the imperial workshops or *karkhānās* and to intervene in the production of the luxury items as well as the weapons being fabricated there. He introduced ways of lifting water up to the upper chambers in his palaces at Fatehpur Sikri; bullock-driven geared machines for cleaning/smoothening of up to sixteen gun-barrels by a geared device called the *barghu*; his chronicler Abūl Faḍl in the *Āin-i Akbarī* also credits him with having introduced new ways of fabricating handgun barrels and making cannons more portable. Apparently, Akbar also invented large prefabricated encampments and pontoon bridges. He copied Chinese geared wagons to innovate mobile bathhouses and corn mills. His interest in the methods of dyeing woollen yarn led to new ways of weaving patterned textiles. His patronage to Abūl Faḍl and to Shah Fat'hullah Shirazi allowed the latter to work out an entirely new *Ilāhi* calendar in honour of his reign and to compile the biggest written record of any king till that time-the *Akbar Nāma.* A part of this massive *Domesday Book*, the *Āin-i Akbarī* contains an account of all the scientific concepts current in the 16th century, and from it we come to know of the theories on the propagation of sound, light, specific gravity, and about the continuing influence of Aristotelian philosophy on medieval Indian rationalism. We also learn of fascination the Pantheism of Ibn al Arābi held for Akbar in matters relating to state and religion; hence we are able to comprehend the spontaneous 'secularism' of a medieval monarch.

The *Āin-i Akbarī* tells us about the new syllabus that Akbar ordered to be introduced in the madrasahs - a syllabus that was to include Agriculture. Household Economics, Land Area Measurement, Medicine, Geography, and the usual Mathematics, Jurisprudence as well as Vedic Philosophy and Grammar.[5]

His successor Jahangir too had his scientific interests. He was an avid naturlist and his memoirs, the *Tuzūk-i Jahāngīrī,* are a virtual encyclopaedia of all the information on plants and animals and even minerals that fascinated him during his brief stint as the emperor between 1605 and 1627. In fact, during the latter part of his reign, it was his wife Nūr Jahān who took care of the mundane affairs of the state and allowed Jahangir the pleasures of a distracted life.[6] Jahangir also encouraged the famed family of astrolabe makers of Lahore to step up production of these astronomical 'computers' and no fewer than 32 astrolabes as well as 16 celestial globes dating to between 1567 and 1683 are still extant.[7]

The architectural masterpieces constructed under the close supervision of his successor Shāh Jahān too would not have been possible had Jahāngīr not encouraged this family of geometers to develop their trignometric skills into architecture. And so it was from this same Lahori family that Ustād Ahmad Mi'mār and Ustād Latfullāh Muhandis had emerged to design and execute a construction project that resulted in the Taj Mahal as well as the Agra Fort.[8] Apart from these sciences, Shāh Jahān's period was also known for the flourishing of the school of logic and philosophy run single-handedly by Ustāb Abdul Hakim Sialkoti. Individual instructors specialised in a particular text or set of texts were patronised by the elite to acquire complete mastery over a particular Greek or Arab scholar's texts. Such knowledge would either lead the pupil to a career in education - or be useful in polite circles and assure upward mobility. In this period too Balkrishna Brahmin's untutored account of his daily visits to the mosque, carrying the shoes of his teacher Mulla Jālāl Hissāri, highlights the 'secular' nature of the education provided in the mosques and how the need for knowledge did not differentiate between Hindu pupil and Muslim teacher.

The resources of the Mughal Empire that the eighteenth century 'Awadh rulers and entrepreneurs in political power' had so eagerly coveted, and inherited, included, apart from agrarian-military resources, scientific information and technological skills-as well as devices. The Awadh Nawabs truly inherited the tradition of 'Mughal

scientific and technological skills', which the latter had been developing and applying in order to sustain their authority in an alien land.

Early Intellectual Exchanges with The French

Sixteenth century European travellers were not a novelty for the Mughal court. Almost every Mughal emperor since Akbar had seen his share of traders, physicians, artillerymen and envoys from Britain, France, Italy and Holland come in search of buyers for their expensive wares. Their travelogues generated a fascination for the Mughal Empire and its wealthy nobility and induced commercial interest.[10]

The earliest exchange that attracts our attention was the one that occurred between Dr. Bernard and Jahangir. Information on this association between an emperor who was also an avid naturalist and a physician from France in the early decades of the 17th century is not reported in his *Tuzūk -i Jahāngīrī* (or his Memoirs).[11] However it was into this pre-existing environment of exchange and accommodation establishied by his predecessors and Shah Jahan welcomed the French physician François Bernier in 1655. Bernier travelled around India and his account of the empire is a useful document for all historians who wish to understand Mughal India.

When Aurangzeb battled for and finally ascended the throne in 1658, François Bernier was appointed the Court Physican and his Indian host Mulla Shāfi Yazdi alias Danishmand Khan was exempted from personal appearances at Aurangzeb's court. This was done in order to enable an uninterrupted translation of the European texts in Bernier's possession and exchanges of ideas between the two. This was quite a concession from one who is reviled as a religious bigot today. Bernier translated and explained to Danishmand Khan the essence of the Cartesian worldview that had captured the imagination of 17th century European philosophers. [12] With *Skepticism* as its guiding principle, it would not have gone down well with the orthodoxy at the Mughal madrasahs. However, fortunately for Bernier, Aurangzeb had, in his famous outbust against his orthodox teachers, shown how he detested their syllabi and how desperate he was for a wider view of the world and its philosophies.[13]

Apart from explaining Descartes, Bernier also gave lessons on anatomy and on the circulation of blood as was being propounded by Harvey in England. He even

dissected sheep to demonstrate to his hosts the concept of circulation-which did not impress the Indian *Hakims.* Theories on circulation of blood were, for them, old hat, because Galen had talked of 'tides' in the production of blood in c.200AD; later Ibn Sina, their *Shaikh ur Rais,* had given more details to this concept in his *Qānūn al Mas'ūdi* in the 11th century.[14] The Indian scholars were interested more in the cosmology and philosophy that Bernier had to offer. Danishmand Khan invited the Brahmin pundits to discuss the remarkably familiar ideas of Descartes and Gassendi and for months, his house was a lively place with all sorts of views being discussed. Danishmand Khan was so enthused by the discussions and the claims of similarity by the pundits that he tried to acquire a copy of the *Vedas* but was unable to do so.[15] Here again the basic defect of reticence between medieval scholars, i.e. their aversion to opening up their texts for examination, prevented a possible synthesis between the teachings of Descartes, Gassendi and ancient Indian materialism.[16] However by the mid-18th century, French astronomers such as Pons and Calmette did not have to face this prejudice, and they were easily given a part of the Vedas. Gentil too had a completely welcoming experience at Benares, when he found no problems for getting copies of Sanskrit texts, and Polier (c.1760) explicitly states that contrary to popular prejudice about Hindu scholars, they were even willing to give him their texts - which is why he got the first complete copy of the four Vedas.[17]

This was also an important juncture in the history of India's intellectural exchanges with France because Bernier was bringing with him, ideas that were new and had not become current even in Europe! The more intellectually inclined among the Mughal elite were aware of atomistic philosophy, in the form it had existed in, especially in the ideas of Leucippos and Democritos. They had read the Persian and Arabic translations of these Greek and Hellenistic scholars by the early Arab translators such as al Kindī and Hunain ibn Ishaq. This idea of atomism now suddenly acquired importance in 17th century India as a result of the translation provided by François Bernier of the works of Pierre Gassendi (1592-1655). The attempts by Gassendi to reconcile mechanistic atomism with Christian belief in immortality, Free Will and the existence of an Infinite God and therefore infinite Creation were taken up by the man who was to assume immense importance in the 18th century, namely Qāzi Muhibullāh Bihāri. Bihāri's treatise on the *Diuz la yatadjuzzā* meaning 'the particle which cannot be divided any further' - was completed just a few years after the works of Gassendi

had been popularised in India by Bernier and Danishmand Khān. Incidentally it was the same Muhibullāh Bihāri who went on to write his *Risālā (treatise) on Time,* and *on Motion*-both of which became standard textbooks for the students of the early 18th century curriculum popular in Lucknow and Awadh as the *Dars-i Nizāmia.* The Atomist Muhibullāh Bihāri was a student of Shaikh Qutbuddīn Sāhalvi, whose son Nizāmuddīn designed the *Dars-i Nizāmia*; lit. 'The Curriculum of Nizāmuddīn.[18] This syllabus that became the backbone for higher education in 18th century Awadh, laid so much emphasis on Greek logic and reasoning that the mullāhs of Awadh and Delhi denounced it as it was considered anti-Islamic.[19]

There was another historical reason underlying the 'rationalistic bias' of this *Dars-i Nizāmī.* In the twin branches of early modern Muslim education, namely between the religious (or *manqulāt*) and the rationalist/philosophical/Aristotelian branch (or the *ma'qulāt*), Sialkot, Jaunpur, and Khayrabad had emerged as centres for the teaching of the latter branch. Even in the heyday of imperial rule, the larger Awadh region of Jaunpur and not Delhi was an important centre for the Rationalists. Here Mullā Mehmood Jaunpurī (d. 1652) wrote one of the most enduring textbooks on non-Islamic philosophy entitled *Al Shāms al Bāzighā* that formed the cornerstone in all non-religious curricula. Awadh was important also because the most celebrated philosopher at Akbar's court, Fat'hullāh Shirāzi (d.1589), had his writings most closely studied and propagated via his pupil Abdussālam Lāhawri. Lahawri's direct line of academic descent involved many popular teachers from the Awadh region such as Mullā Abdussālam of Dewa, who was also Chief Mufti of the Mughal army and who died in 1630 AD. Other luminaries were Shaikh Daniyal of Chaurāsa, and Mullā Qutbuddīn of Sihali. The last was the father of Mullā Nizamuddīn Sihālvi, the founder of the Lucknow-based Firaṅgī Mahal School of Indo-Islamic scholarship known as the *Dars-i Nizāmī.*[20]

Thus well before our period of study, Awadh possessed the rudiments of an 'intellectual renaissance'. Before our period of study too there were other French travellers interacting with the Mughal elite. For example Tavernier's search for the perfect diamond had led him to draw an illustrated catalogue of all the major diamonds and their geometry in the jewellery collection across India in the 1660s. There were others too such as the Jesuit fathers Pons and Boudier, d'Anville, Danet, Barbier and the German Jesuit Joseph Tieffenthaler who studied the longitudes in Al-Bīrūnī,

Naṣīruddīn Ṭūsī, Ulugh Beg, and in Abūl Faḍl and corrected their co-ordinates (longitudes and latitudes) for places across India - especially for the cities of Awadh such as Lucknow, Faizabad, Bahraich, Khairabad, Balrampur, Mohamdi, Banaras, etc. Claude Boudier (1686-1757) and Francis Pons (1698-1752) must be also mentioned as those who brought to India the first copy of la Hire's *Tabulae.* Most of the Jesuits were mainly involved in the astronomical researches of Sawai Raja Jai Singh (d.1743) and that episode in the history of Indian sciences has been very thoroughly researched by V.N.Sharma, Razaullah Ansari et al.

Elite Technical Traditions

Even as the Mughal emperors encouraged philosophical rationalism, they also believed in their traditions of technological interventionism via the setting of personal examples, and encouraging technically active nobles with promotions if they followed the royal example.

However, personal example would not suffice to keep the wheels of such a vast military organisation with its attendant agrarian and craft production as well as its accountancy, healthcare and educational needs running - a vast body of technical literature would also have to be produced. Such a corpus did exist and it was compiled and copied by the vast army of clerks, accountants and copyists working in the ateliers of the emperor as well as those of his nobles. For example there was Moosvi Khān, and other nobles whose innovations on the tempering of swords, making of soaps, perfumes, masonry targets, even hair dye were compiled and copied for others in handbooks that bore titles such as *Biyāz-i Khusbhui* or *Biyāz i Mureed Khān* etc. The other sources of information for them were the *Dasturul Amals*, the *Farhangs* and the *Majmu'at us Sanā'at* literature that were encyclopaedia containing descriptions of all the elite related techniques.[21] There were specialized treatises on horses (the *Farsnāmās*) and on swords (*Shamsheernāmās*). [22] There are still many *Risāla-i Zarā'at* and *Risāla-i Falāhat* that have not even been noticed. There were, as well, hosts of other nobles whose diaries, though difficult to come by, contain bits of technological information. Even if it relates to a better way of making *kābābs* if changes in processes and tools were involved, it was innovation or at least intervention.[23] The bravest challenger against British colonialism, Tipu Sultan, wrote perhaps with the help of the French, the first useful manual on the handgun entitled *Risala dar Adab-i Tufang* (lit. 'A Treatise on the Etiquette of the Handgun').

Incidentally, Haidar Ali sought French military technology in the 1750s and then Tipu in 1788, sought and received the services of French gun casters who also set up the first Indo-French gun boring machine.[24]

A piece of evidence which prompts us to come out of our biased macho image of the non-technical Mughal nobleman is found in an imperial 'Book of Regulations' written c.1700. This manual for the rich lists useful knowledge and the honourable crafts as follows: iron working, gold working, engraving, alchemy, weaving, sewing, carding, dyeing, pottery making, and cooking.[25] How far this advice was adhered to seems difficult to assess; even comprehending this fact is difficult with our current preconceptions and our popular image of "noble and manly pastimes". In fact an eighteenth century Afghan prince, Qaim Khān Bangash, was a keen caster of cannons as well as a designer of footwear whose styles are still worn in the Doab.[26] Similarly a century earlier, the Mughal emperor Akbar was praised for his interest in the crafts by his chroniclers Abūl Faḍl and Nizamuddīn Ahmad.[27]

Therefore, insofar as elite scientific as well as technical interest was concerned, it was never lacking. In fact, a bio-bibliographical survey conducted some 20 years ago produced a volume that cites several thousand entries.[28]

The Eighteenth Century Libraries

A major indicator of a civilisation's intellectual stature is the manner in which it preserves its literary heritage. There are Persian manuscript collections in London, Paris, Oxford, Cambridge, Dublin,Glasgow, Berlin and even in Aberystywith, that were once busy libraries in India. They were carted away from the palaces of the Mughals and later from the libraries of 18th century rulers such as the Nawab of Awadh, the Afghan chief Hafiz Rahmāt Khān, the Mysore ruler Tipu Sultan, etc.- initially as a part of the looting that followed in the wake of early British conquests and then with the onset of Orientialism, out of a desire to preserve them for the superior western scholars; to save them from the destructiave hands of the natives.[29] The books in Khuda Bakhsh Library, Patna, [30] in the Raza Library, Rampur, [31] as well as those in Hyderabad, Aligarh, and in the library of the Asiatic Society in Calcutta are the few that managed to survive this drain of intellectual wealth.

However, prior to this colonial looting, provincial courts such as Awadh had become the repositories for the books once owned by the Mughals and the nobles serving the Empire. Thus in the 1780's the library in Lucknow had 300,000 volumes with hundred of attendants. 'All the jewels in Asaf ud-Daulāh's vaults would not have paid for a fraction of this treasure in books', says a later chronicler.[32] He makes it a point to add that only 700 were 'inherited' from the libraries of the *Salatin-i Taimūrīya* i.e. the Mughal kings - the rest were later acquisitions.[33]

The French were avid buyers of Sanskrit manuscripts - some of the Jesuits like Pons had them copied both for their centres in India as well as for the Bibliothèque du Roi in Paris which besides its official commission from the King, was also building up a good collection of Farsi and Arabic mss through the efforts of Law de Lauriston, Anquetil du Perron, Gentil, Polier, Claude Martin was collecting them for himself and it was his collection that was most callously sold off in lots and thus dispersed between 1801 and 1805. A similar fate was reserved for his collection of natural history drawings that he had ordered his commissioned and trained Indian artists to execute.[34]

The collections of the upstart Afghans of the mid-18th century were remarkable too. In his 'Report on the Researches into the Muhammadan Libraries of Lucknow', the German cataloguer Aloys Sprenger described these as containing mostly books on Geography, Travelogues, and Poetry. Books on Medicine, Hunting and Hawking were also popular. There were also encyclopaedias on Natural History, Agriculture, and Veterinary Sciences (particularly on Horses), on Archery, on Alchemy as well as books on Magic. Furthermore, until as late as in 1849 the Farhat Bakhsh Collection was in good condition due to the sense of responsibility among the 'rich natives' of Lucknow. For example, Bodleian Pers. 1908 and Ouseley Add. 10 that are entire catalogues of the collection of the Lucknow-based Achhé Sāhab, the grandson of Hafiz Rehmat Khān, now in the Bodleian Library, at Oxford.

I have thus demonstrated how under the Mughal empire, a vast array of literary and patronage resources were available to those wishing to take up a career in scientific learning or even acquiring technical information. In the eighteenth century, the more useful technical know-how being transferred to the provinces related to military organisation, agriculture, craft production technology, town building and to education. It is this last resource to which we shall now turn to demonstrate the intellectual

awareness that prevailed among the scholarly classes and how the patronage given to education by the new elite produced *literate agents* for the *Awadh Renaissance.*

Education, the Schools and their Syllabi

The Awadh Renaissance was not solely driven by the European intervention or the past Mughal tradition of science and technology. In fact an insignificant act of piety that redeemed Aurangzeb's place in the intellectual history of pre-modern Awadh also provided sustenance for a new and rationalistic syllabus in this region. To substantiate this point, a renowned scholar Qutbuddin had been killed and his son Nizamuddīn was just 14 years old when he arrived in Lucknow after abandoning an unsafe madrasah and family estate at Sahali in the adjoining district of Bara Banki. Though distracted by the war in the Deccan, Aurangzeb had sent specific instructions for the allotment of an abandoned Dutch trader's house (lit. *Firaṅgī Mahal*) for the family of the deceased in 1693. This was how the appellation *Firaṅgī Mahal* got permanently associated with Nizamuddīn Sahalvī and his School. Its unique curriculum was referred to as the *Dars-i Nizamī.* This syllabus laid so much emphasis on Greek logic and reasoning that it was denounced by the mullahs of Awadh and Delhi as being anti-Islamic.

In the words of Mohammad Raza Ansari, the biographer of Mulla Nizamuddīn, the *Dars* was not a fixed programme with a fixed set of books, but more of an approach to education. Students began by reading works by the sources approved by Mulla Nizam and these books would therefore be some treatises on Greek *falsafa* or Rationalism. According to Raza Ansari there were critics of this bias towards rationalistic texts but then he asks, - when was such a bias *not* in evidence? Even Shāh Waliullāh who went to the 'purest madrāsāh' - the *Madrāsāh i Rahimia* in Delhi in the first half of the eighteenth century, complained of having his head crammed with Greek *falsafa.*[35] Fortunately for the Awadhis, the influence of Shāh Waliūllāh and his Orthodox Syllabus (he even wrote an entire treatise to disprove the Heliocentric Theory propounded by Copernicus) was confined to Delhi and its environs. It was a depressing era in the history of that resilient city and all sorts of religious devices were being resorted to in their desperation to keep poverty and humiliation away from one's doorstep.[36] The other way out was to leave Delhi and to seek patronage in Awadh.

The Nizami system was successful because it was devised in response to the growing demand for more information on the Greco-Arab rationalism based on the works of Aristotle, Plato, Ibn Sina, Ibn Rushd, al-Bīrūnī, al-Abhari, Sadruddīn Shirazī, Mir Baqar Damad, Najmuddīn Qazvinī, Zahid Al Harawī, Sa'duddīn Taftazānī, mediated by a host of commentators from India, Iran, Central Asia, Egypt, etc. [37] In the words of the author of *Maasir ul Kiram*, Azad Bilgrāmī, the Rational Sciences were becoming popular in Awadh "and students, in groups upon groups, moved to the cities in search of this knowledge".[38] It is a well-known fact of history that most of the poets and prose-writers of the Mughal Court were moving to Awadh and Hyderabad due to the lack of stability and patronage in Delhi. The study of the texts on logic, mathematics, rationalism, atomism, Aristotelianism, even Cartesian mechanics would free the minds of the youth and teach them to think logically in any given situation - especially in comprehending the new rules and regulations and early colonialism.[39] Every teacher had his own standard teaching texts and each student would be assessed for his capacity to grasp new and abstract comcepts because they would be started on the most difficult treatise on a given topic and the master would thoroughly coach the student in the questions raised and their explanations. Once the toughest works were mastered, the scholar could handle any treatise on the subject. *Bahr ul Ulum*, the Principal and the son of Mullā Nizām, has given a complete account of this approach in his *Risala-i Qudsia* and it appears to be an intense, research-oriented one. However over the 18th century, with the demand for his method from the neighbouring territories of the Rohilas, from Bengal, from Madras, and Bhopal outweighing the availability of personal tutors, certain essential textbooks had to be prescribed. In addition to the minimal dose of *ḥadith, akhlaqiyat* (ethics), *ilahiyat* (on God's nature), *tafṣir* (Quranic commentary), the *dars* shifted the emphasis to legal studies, logic (*mantiq*), wisdom (*hikmat*), natural philosphy (*taba'iyyāt*), Euclidean geometry (*Uqlidis*), mathematics (*ilm al-hiṣab*) and astronomy (*hai'at*).

The *dars-i nizāmi* had only one book on the study of *Ḥadith* and five each on the study of mathematics and logic, in addition to three of the most advanced texts on natural philosophy and physics, two texts on Islamic jurisprudence and two on *'ilm al-kalam* or scholasticism. Those wishing to specialise in Greco-Arabic rationalism were drilled in the various sections on medicine, logic, maths, physics and metaphysics. They were taught the *Ishārat wa Tanbihāt* of Ibn Sina which took the mystic from a

novice stage to the direct vision of God. For others Euclid was taught from Hajjaj bin Yusuf's translation along with commentaries by Naṣīruddīn aṭ-Ṭusi as well as Quṭbuddīn Shairāzī. The original writings of these two on Optics were taught to those interested in geometry and optics. For those keen about pursuing natural philosophy or physics, they were made to master the text referred to as 'the Mullā Hāsan' - a compendium on Greek science written by Mullā Hāsan Firaṅgī Mahālī, the Principal of the School after Bahr ul Ulum had deserted and left for the Rohila Nawābī in the 1766. Another popular indigenous scholar of natural philosophy was Abdūl Hakim Sialkoṭī who was famous for his commentary on *Baidawi*.[40] Most popular however was Mullā Sādrā or Sadruddīn Shirāzi (d.1640), an Iranian who had demonstrated the possibility of an indivisible final particle, *ḍuzz la yatādjuzzā*' in a treatise entitled *Risāla Musānnat wa'l Musallās bi al Tākrīr* which was also among the topic taught[41]. So also was his commentary on al-Katibi's *Hidāyat al Hikmā*, which was the standard text for those wishing to specialise in physics and metaphysics. Students of Firaṅgī Mahal were encouraged to write critical commentaries on the great masters such as Mullā Sādra, Mehmud Jaunpuri, and Ibn Sina. Thus all shades of philosophical trends—the Platonist, the Aristotlean, the Neoplatonist, the Atomist, the mathematical, the natural philosophical, the medical, the Kalamists,— all were finally allowed to flourish and be studied at the Firaṅgī Mahāl . The ability of Firaṅgī Mahāli graduates to grasp difficult comcepts and to write clearly argued essays on its contents attracted the attention of 'Orientalists' like Warren Hastings and William Jones who needed such youth to man the new courts and revenue offices being established for 'the natives'. A degree from the Firaṅgī Mahāl thus became a desirable qualification for those aspiring for Company service.[42]

Patronage by the Awadh Nawabs

While the Nawabs of Awadh were highly supportive of a syllabus that included works by Iranian scholars such as Sadruddīn Shirāzī, al Abhari, Āli Jurjāni, Saduddin Tafiazāni, Bahauddīn Āmili (see book entitled *Khulaṣāt ul Hiṣab*) and Mir Baqīr Dāmad because they saw it as an enrichment of the Shia religious philosophy. For the teachers at the Firaṅgī Mahāl, all students capable of the rigor involved, Shia, Sunni, or Hindu, were welcome to enrol.

The Shia Nawāb had another reason to support this school. For them, the maulavis of Firaṅgī Mahāl were an influential voice among the Sunni elite that could help them in consolidating their political power. They confirmed and enhanced the old Mughal land grants made to the school and its founders by Aurangzeb. The school was strengthened when a diploma from Firaṅgī Mahāl became an essential qualification for all aspirants to employment in the state apparatus. Its graduates were given important positions in the legal and religious departments. Proximity to the state however had its disadvantages. During the first violent clash between the Sunnīs and the Shias, the school was attacked and Shia rioters killed two students in 1766. Shuja was the Nawāb then and he was too engrossed in the rapid construction of his new capital at Faizabad to bother. As a result, Abdul Āli entitled *Bāhr ul Ulum* or Sea of Wisdom, Principal and son of the founder Nizāmuddin Sāhalvi, left for the Indo-Afghan territory of Shāhjahānpur, from where he was invited all over the country until he died in Madras in 1793. In a way, Awadh's loss was a gain for the rest of the native states in general and for rationalism in particular.

Apart from this school, there were the emerging *nouveau riche* segments within the elite such as the revenue farmers who too were establishing new centres for education. After 1775 this class of rentiers, consisting of magnates such as Tikait Rai, Mian Almas Ali, Hakim Mehdi, et al., was flush with funds that the well-cultivated Indo-Afghan or 'Rohila' territories, NE of Lucknow, had fallen in their hands, along with the suba of Allahabad that had already been 'sold' to them by Hastings. These revenue-farmers or *ijārādārs* were keen to attract favourable public attention by supporting schools and encouraging young men to join as sudents[43]. Private tutors and the copyists too found new patrons in the form of he *nouveau riche*-traders, Company officials indulging in a bit of Orientalism and European adventurers keen to make money in the Antiquities market all of whom were benefiting from the construction of new regional states and their capital cities such as Faizabad and Lucknow. However, the most durable support remained the land grants in the countryside and the best literary-scholastic training that was available in the qasbas centred on such large Saiyid grant-village such as Sandila, Amethi, Gopamau, Jais, Kara, Manekpur, Mustafabad, Bilgram, Hardoi, Safipur and Rudauli[44].

The court of Āsaf ud-Daulāh who ascended the *masnad* in 1775 acted as a magnet for the poets of the Mughal Court such as Mir, Sauda, Soz, Qāteel, Mushāfi, Inshā'āllāh Khān and Sādat Yaar Khān Rangin. They came not just for the stipends that were offered, but also because of the intellectual climate of the place. Furthermore their favourite Mughal prince Mirzā Sulaimān Shukoh had also taken up residence in Lucknow and was getting Rs. 6000 per month that he distributed among these poets. These were no ordinary lackeys; they were well read and could discuss politics, rational sciences as well as contemporary European poets. Thus in one poem Insha wrote of how Romilly, Keats, Arnett and others stood respectfully around the prince when he was reciting his poetry.[45] Even sycophancy was tinged with knowledge of the western world!

The question that arises in the mind of any western reader about the educational and intellectual environment just discussed would be about the changes in science that this 'intellectual quickening' was bringing about. For the present all we can say is that Awadh kept alive the traditions of learning that had been sustained and developed first by the Sultanate and then by the Mughals. The Nawabs of Awadh, like their Mughal forebears, were providing patronage to the military, agricultural and craft techniques and their technicians, on a smaller though significant scale. The Firaṅgī Mahalis and their patrons were in a way playing the same role that the *Bait al-Hikmāt* in Baghdad had played in the 9th century AD when it had acted as a gatherer, translator (and a critical one at that), re-organiser, as well as a repository, of the vast body of scientific as well as philosophical-scientific literature that was then, as during the era of Mughal decline, under threat of extinction. The Arab translator-scientists had never been the ones to break into new areas of research; to broach new problems, to establish institutions wherein continuity of research would be insured, but the manner in which they reorganised the knowledge they had inherited and the logical way in which they worked linkages into the different fragments through their commentaries, one can say that it was they who gave Medieval Europe the format for the universities they established in the 12th century. The libraries of Lucknow, as already described, also played an important role in this noble venture.

Thus did the elite of Awadh safeguard, sustain and reorganise the intellectual and technological activities inherited from the Mughals until the arrival of the French men of

science. These strange men and the problems they researched were quite easily understood because the atmosphere of reasoning and debate nurtured by Danishmand Khān and Bernier had not been allowed to die. In fact, this most receptive audience of Awadh was also the one that absorbed many of the new western ideas and techniques, and then sent forth its own modern men of science and arts to lead the nation in its struggle against imperialism[46].

The French 'Scienists'

The visibly enhanced 18th century French presence in Awadh was related to two British victories in South Asia. The first was the defeat of the French at Wandiwash in 1761; the other was their victory over the combined forces of the Nawabs of Awadh and Bengal and the remants of Mughal imperial power at Baksar in 1764. This made both realise the need to assist the other in their bids to remove the British from the mainland. Therefore when in February 1774 Comte de Modave had come upon the ragtag army of French mercenaries at Faizabad, he was not surprised but filled with dismay. This force had been raised by Shuja ud Daulah to break free from the increasing interference of the British East India Company was not in fit condition. The early French mercenary Col. Gentil, who had helped him in establishing an arsenal in 1767, had assisted him in recruiting this regiment. Now within six years this army was in decline because the British, alarmed at the quality of the troops put together by the French, [47] had forced another cut on Shuja's forces in 1768. Now these remnants were in disarray - "Everybody is an officer here, no one wants to be a soldier," wrote Comte de Modave in his travelogue dated February 1774. However, he did add that the flintlocks at Faizabad were as good as the best in Europe.[48] Unfortunately for Awadh, the pressure on the Nawab to dissmiss his French advisors and to close down his weapons manufacturing units was extremely debilitating. Therefore when Claude Martin, the only Frenchman, allowed to stay on in Lucknow because of his proven loyalties to the British, was introduced in 1775 to the new Nawab Asaf ud Daulah, all that the latter had wanted Martin to do was to revive the arsenal in Lucknow. Asaf knew of Martin's interests in fabricating flintlocks and metal casting. He did not know of the latter's interest in architecture, land surveying, cartography, astronomy, in the production of indigo, in the extraction of the perfume, in the use of electricity to light up basements, and his interest in sending up manned hot air balloons[49].

And there was more to the polymath. When he died, the inventory of lab equipment, books, and goods went into 120 pages! They included his favourite item of trade namely weapons that he copied and fabricated for the Nawab in Lucknow. There were numerous telescopes including one that had 21 viewing tubes! There were clocks, astrolabes, terrestrial globes, many microscopes, thermometers, optical instruments, test tubes, hydrostatic balances, Joule's Apparatus for calculating the heat gained or lost in any particular experiment, instruments to check co-efficient of expansion, machines that could generate electricity, cells that could store energy, and there were pumps too to ensure a proper vacuum in the Torricellean batteries, barometers, etc. There were surgical instruments that he even used on himself and there were several Camera Obscura that were used by painters. There were hundreds of books on science and drawings of plants and animals - but the Persian Mss, numbering over five hundred, could not be traced. [50] This corpus of literature shall be traced and researched if it is still in one lot, as a part of a new Project on the history of Indo-French Scientific Exchanges.

Martin used his scientific interests to generate profits too. His experiments with the indigo plant in botany led to highly publicised and extensively conducted indigo cultivation at Najafgarh near Kanpur[51]. Benoit de Boigne, the French 'General' guarding Mahadji Scindia's northern territories from his base at Aligarh, was a partner in this indigo enterprise too[52]. Martin was also cultivating roses and extracting the attar with the help of his friend Queiros. Antoine Polier too was indulging in this industry and had even published a paper in the *Asiatick Researches.*[53] His indigo farm at Najafgarh near Unnao was an open invitation for the others of his ilk to settle down and to join him in his role as an 'improving farmer'. The wealth that he was generating from indigo was there for all to see in the lavishness that he displayed in the construction of his country palace that he had christened as *The Constantia.*[54]

What is of significance here is that apart from his silent interest in collecting reptiles and plants, or operating on himself, none of his other interests was so low profile as to avoid completely any form of socio-intellectual impact. For example, his observatory provoked a native genius, Khaliluddīn Khān, to order the most expensive telescope from England and to set up an Observatory in Lucknow by c.1820. This Khaliluddin was conversant enough with the theory of the devices to occasionally

teach astronomy and was capable of improvising astronomical devices too. The social impact was intended and it did have its obvious impact. Khaliluddīn Khān's book on geography entitled *Mirat al Aqalim* was a prescribed text for all 19th century schools in Awadh and contained accurate co-ordinates for all the important cities of the world.[55]

Martin's interest in metallurgy enabled him to succeed in his job as Officer in Charge of the Arsenal and produced good handguns and cannons for the Nawab. However, in order to remain in Awadh where he had developed an intensive commercial network, he had to prove his loyalty to the British and so, ironically enough, he went to Cossipore in Bengal and was able to cast an immensely long-barrelled cannon that he named 'The Cornwallis' which proved very effective against Tipu Sultan at Srirangaptam.[56]

The fact that he was an experimenter and had his share of failures is evident from the defective church bell with a crack down the side, which sits on a pedestal in front of the Constantia in Lucknow. Martin's Arsenal too was so prominently located in Lucknow that people must definitely have grown familiar with its techniques of production. Apparently, weapon production was a free market industry; Martin's monopoly over the supply of cannon was broken when foundries were set up by Sangster and De Boigne in Agra and Aligarh.[57]

His architecture provoked immense public interest and 'the Constantia' is still an object of amazement for the unwitting traveller. For Asaf ud Daulah, the French and the British manor houses and Residency architecture were a challenge to show off the indigenous skills in this area. An open competition was announced for the best plans for a Mosque and an Imāmbārā. The design had to be original and the ceiling of the Imāmbārā was to be supported only on arches, without wooden beams. The plans submitted by one Kifayatullah, probably of the Luftullāh family, were selected. The results are beautiful and solid and are standing to this day. Moreover, the ceiling is resting entirely on arches.[58] Thus there were high-profile responses to the stimuli coming from Enlightenment Europe via these adventurers and it was not a solo performance by Martin, because Polier, De Boigne, Perron, Gentil, Modave, Madec. Sombre, Pons, D'Anville, Boudier, Danet, even Tieffenthaler, who, like Rev. Wendel, was a French speaking German - all of whom were, nonetheless, representatives of the Influence Française.[59]

Diffusion and Assimilation

The familiarisation of the miniature painters with the techniques of natural history drawings created an entire team ready to take up the task of documenting India's flora and fauna for the Botanical Gardens that had come up outside Calcutta as well as for visiting dignitaries like Bishop Reginald Heber who was highly impressed by the natural history drawings presented to him[60]. However, the most outstanding work of geography, anthropology and art in one volume was the Album drawn for Col. Gentil by a team of Indian artists, including Nevasi Lal and Mohan Singh at Faizabad in 1774. The album contains a collection of drawings depicting the manners, customs, and material culture of the people of India, with special reference to Awadh at the time of Shuja in 1774. This was a true mingling of Enlightenment desire to catalogue, and the Eastern ability to recreate, in all its details, the colours of our festivals, and daily lives, as they existed under the last flourish of Mughal grandeur.[61]

The work of surveying entrusted to Martin by the Company and by Nawab Shuja-ud-Daulah to Antoine Polier could not have been done without the assistance of local *munshis* and porters. Having thus trained and initiated them into the techniques of surveying, the skills that the British Settlement Officers of the 1810's onwards were pleased to utilise.

The books on local geography were also written for the Europeans such as the *Ajaib ul Adyar*,[62] or the *Hadiqat ul aqalim* and the *Malumat ul Afaq* by Murtaza Husain alias Ilahyar Bilgrami for Jonathan Scott, a company official. However, the best indigenous geography continued to be the *Sahid-i Sadiq* of Sadiq Isfahani[63]. However, the cartographers had seen Company surveyors like Claude Martin diligently working towards the production of maps for Rennel's *Atlas of Bengal* (published 1776). Its final impact can be seen in Khaliluddīn Khān's book on geography [64] of c. 1810.

With the beauty of all of God's Creations having been defined by Descartes in the 17th century, it was now up to the 18th century 'des Lumières' to paint, or to assist in the reproduction of the perfect animal. The destruction of the horse-trading Rohila Empire had resulted in a decline in the availability of horses in Awadh. The efforts of the British in horse breeding aroused the interest of Asaf ud Daulah who immediately ordered the import of three Dray horses from England. Unfortunately

the details of stable conditions were not explained to him and by 1793, two of the Drays were dead and one was too obese to be of use for anything - not even for breeding his own progeny. [65] These efforts were continued again under Sadāt Ali Khān and this time a French expert named Antoine de L'Etang was hired for Rs.2000 per month to establish a proper study in Lucknow. Unfortunately, the Nawab did not approve of some of the techniques employed by Antoine as he thought them to be too cruel on the poor beasts and he was sent packing[66]. However, where local expertise was available, the results were remarkable. For example, the elephants being bred at Asaf's stud farm were up to 15 feet tall![67]

However, as we have already seen in the case of French employees in Awadh, the British protector of Awadh did not always approve desire for innovation. For example, in 1772 when Shuja expressed his desire for a fort to be built by Col. Gentil and engineer Canape, along the lines of Fort William in Calcutta, a general alarm was raised in the Council in Calcutta and the project was shot down. How could a protected native ruler even dare decide upon the technology of his own protection? It would be violative of the basic premises on which all defence pacts are constructed.

The famed star fort design that some say was designed by the Italian Antonio Averillino Filaretti in c.1600 was used by Vauban to design a system of defence for France in the 16th century. The same design was popularised by the French in Southern India though Calcutta's Fort William is the last and best evolution of that system in north India. Gen. De Boigne attempted a partial star-fort design at Aligarh in c. 1785 but ended up with something that resembles the place de Dépôt under Napoléon. All this was for his employer Mahadji Scindia and from here De Boigne and Scindia together controlled territory the size of France[68].

All these were high profile activities that were influencing the young and old alike; most importantly they were enthusing the Nawabs and his elite who were the most important agents of change in those pre-modern times. And every scientific act of Claude Martin was invariable used as a display to sustain this partronage; it was as if he was conducting a long visual exposition of all that was new and technoligical in Europe - the Grande finale, though not the end of his display, came in 1785 with the launching of the hot-air balloon!

This constant prodding did have its impact on the local elite - though it took 15 years to become manifest. The Observatory under Khalil Khān we have already discussed; what we failed to notice were the Renaissance Men who appaeared towards the end of the century. One such scholar was Allama Tāfāzzul Husain Khān, the ambassador of the Nawab to the Council in Calcutta. He was an expert in Hikmiyyat (Principles of Medicine) as well as in *Ilahiyat* (Theology). He could converse in Arabic, Farsi, English, Latin, and Greek! He was referred to as the *Arastu* and the *Aflatun* of his age! He translated many works of western philosophy into Arabic and wrote commentaries on several treatises on density, algebra, as well as on the ḥadith and on fiq'h. He was truly a man of his times [69] and he passed away in 1800. There were many others like him who had been trained in the traditional method that had enabled them to grasp the modern European concepts. In 1785, Ghulam Husain Tābatābai wrote the first economic analysis of colonial rule by a native: it was an exposé of the 'drain of wealth mechanism' that was just then being set up by the British East India Company [70]. Others wrote *Mukhtasārs* or Summaries for college students with brief explanations of Qushji, Mustawfi, Nāṣiruddin Ṭusi et al., writing on the nature of the intellect, on natural occurrences, on lunar and solar calendars, on Aristotle's theory of four elements, on the philosophical and the practical sciences, etc. Others wrote guidebooks on étiquettes for French travellers known as the Amoz literature. One such book written for a Monsieur Auson (?) contains sections on arithmetic, calendars, verses on the qualities of people from different regions, on different cities of India, on the various harvests, verses on women, on music, on impressing women, kinship terms in French, Bengali and Persian, pulse reading, medical formulations, on weapons, etc. A more useful guide has yet to be written.[71]

In the field of material culture too, the French presence was very palpable in Lucknow. Asaf ud Daulāh preferred French chefs to look after the culinary needs of his European guests. The British too were probably the most pleased at the prospect of not having to eat food cooked by a British chef. Claude Martin supplied all sorts of household goods to the elite families so that a little bit of France came to be situated in the Nawab's palace and elsewhere too. However there could be embarrassing mix-ups too, for example when the China pisspot would appear on the breakfast table as a milk-bowl!

In the area of equitation, a new kind of Awadhi saddle was designed by the local saddlers on the basis of the samples coming in from Europe and Central Asia. [72] Ghaziuddin Haidar developed an interest in propeller driven ships and is said to have

had one constructed according to his own design. Nawab Ghaziuddīn Haidar also wanted to construct an iron bridge over the river Gomti, but problems of finance killed this project. However, an excellent bridge with eleven Gothic arches, clearly indicative of European influence, [73] was started by Shuja and completed by Asaf u Daulah in the 1780s.

Conclusion

Finally with the arrival of deeper colonial control over northern Indian education, this indigenous genius to innovate was suppressed by a over-arching desire to dominate and replace the indigenous system of education. The translation program at the new Printing Press (established in 1817) gave priority to Brougham's book 'Treatise on the Objects, Advantages and Pleasures of Science'; others on the list were 'The History of Mexico', a 'History of China'; as well as several books on Anatomy, Personal Hygiene, on Compound Medicines, on English Pharmacopoeia, on Farriery, on Physiology, and a book on Sea Singnals![74]

After 1857 the British colonial regime came out of the Revolt with a more enhanced sense of paranoia and embarked on a more interventionist program of re-educating the masses. The result was a strange failure with the schools and the madrasahs all going into the lethargy that usually accompanies monasteries run by clergymen and/or imperialistic pedagogy. The religious orthodoxy was once again in charge — much as they are being promoted under the communal-majoritarian government of India in these dark days. Then, as now, the obscurantist were the most-preferred clients and the *Report on Education in the United Provinces, c. 1911,* by Sidney and Beatrice Webb, has given a very depressing account of educational institutions that the British had established to replace the 'native system' that just a few decades earlier was buzzing with activity and learning.

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Notes and References

1. The debate on 'The Eighteenth Century' is getting deeply academic. The present paper is a part of my ongoing project, 'Technical knowledge and State Formation in 18th Century Northern India', a post-doctoral project based on my Ph.D Dissertation, SOAS, 1990. Ever since Rich Barnett's *North India between Empires*, Berkeley, 1980,

and Muzaffar Alam's *The Crisis of the Mughal Empire in 18th Century Northern India*, New Delhi, OUP, 1986, broached the issue of looking at the decline in terms of a reorientation of military, agrarian, urban and intellectual resources, the traditional view put forward by the 'Aligarh School' is being re-examined; and most virgorously at Aligarh itself. The basic thesis of the first half of the century being one of looting and rapine and the second half one of colonial plunder is being broken up into even smaller constituent parts and re-examined for purposes of more micro-historical analyses. In fact, the best writings on the 18th century have again come from stalwarts from Aligarh such as Prof. Irfan Habib, and the late Prof. Athal Ali. Irfan Habib's "The Eighteenth Century in India's Economic History "Proceedings of the Indian History Congress (hereafter Procs. IHC), Calcutta, 1995; as well as his vastly rewritten Introduction and Conclusion to his revised edition of The Agrarian System of the Mughals, New Delhi: OUP, 1999. Prof. Athar Ali's"The 18th Century - a Critique of the Revisionist Approaches,"*Procs IHC*, New Delhi, 1992 and the Introduction to the revised edition of his The Mughal Nobility under Aurangzeb, New Delhi:OUP, 1997 were a reassertion of the 'two-halves' theory but with wider perspective, and greater sophistication. The other works published/forthcoming from Aligarh are the book *The Rise and Decline of the Rohila Chieftaincies in 18th century N.India* New Delhi, OUP, 1994, by Iqbal Husain. An unusual approach to state formation has also been taken up by the present author in his forthcoming book, I.G.Khan, *Crafts, Agriculture and Warfare-Technical Knowledge and State Formation in 18th century Northern India*. More work is in progress at Aligarh, Delhi University, JNU, Leiden and of course at 'the other place' of 18th century studies, Cambridge. We are fortunate in having attracted the attention of scholars such as Peter Marshal, Chris Bayly, Francis Robinson, and Richard Barnett at University of Virginia. Barnett's forthcoming Re-examining Premodern Indian History is bound to enrich our understanding of this complex and multi-faceted century.

2. See details in Wheeler M. Thackston, *The Bāburnāma: Memoirs of Bābur, Prince and Emperor*, OUP, 1995, see also Muhibbul Hasan, *Bābur the Founder of the Mughal empire*, South Asia Books, New Delhi, 1986.

3. Ms No 87, University Collection, Central Library, Aligarh Muslim University.

4. Ms No. Or 1717, Rieu, British Museum Persian Collection.

5. This is a very compressed survey of the elite intervention in science and technology in the 16th century sources. An earlier survey appears in my essay in R.B.Barnett, ed. *Rethinking Early Modern India*, Manohar, Delhi, 2002. See details in I.G.Khan, *Scientific and Technological Information in the Ain-i Akbari*, M.Phil Dissertation, AMU, 1980. I am now revising this monograph for publication for Orient Longman, India. Brief descriptions are available in the articles by this author, by Shireen Moosvi and Irfan Habib on 'Akbar's scientific and technological interests' in Irfan Habib, ed., *Akbar and his India,* OUP, New Delhi, 1997.

6. He even insisted on a dagger fabricated from a piece of meteorite that had been retrieved for him. See details in M.A. Alvi and A. Rehman, *Jahangir the Naturalist,* INSA, New Delhi, 1972.

7. See details in S.R. Sarma,'The Lahori family of Astrolabists and their Ouvrage',*Studies in the History of Medicine, Delhi*, Vol. XII, 2(1994), 205-245.

8. A.J.Qaisar, *Building Construction Technology in Mughal India*, OUP, New Delhi, 1988.

9. Balkrishna Brahmin, *Maktubaat*, Ms No Add 16859. I am grateful to Prof. Iqtidar Alam Khan for this reference.

10. On the motivations underlying these explorations, see Rila Mukherji, "Space,Knowledge and Power:Geography as a Machine for Mastery in the Age of European Expansion 1200-1800" in Ranjan Chakrabarti, ed. *Space and Power in History: Images Ideologies Myths and Moralities*, Jadavpur Studies in Area History (JSAH), Penman, Kolkata, 2001, pp.1-36

11. Nonetheless a closer examination of the contemporary Persian and French sources are bound to yield more than what has been reported in the book by M.A.Alvi and A.Rahman, *Jahangir-the Naturalist* (published by INSA almost thirty years ago). There is a need for search for the papers of Dr Bernard in Paris and elsewhere to assess the impact of this early exchange. [If Bernard is French and not Italian: see now Françoise de Valence, Médecins de forturne et d'e fortune..., Paris, Maisonneuve et Larose, 2000, pp.136, 140].

12. Ruqaiyya Kazim Husain,"Danishmand Khan -a Scholarly Noble at the Mughal Court", *Proceeding IHC*, 1997.

13. In 1661, when Aurangzeb was approached by Mulla Saleh, his tutor, who wanted a reward for having coached him to glory, Aurangzeb responded by criticizing Abdul Saleh for failing to teach him things essential for a Mughal monarch. He had not been taught Geography which would tell him about the regions's resources, o about the peoples and powers at the imperial borders. No information had been given to him on the histories of other people leaving him in the dark about the causes for their rise and decline, nothing on the art of administering men of such diverse religio-legal beliefs; nor had he been taught the art of war. He concluded with the following lament -"But you taught me to read and write Arabic...Forgetting how many important subjects ought to be embraced in the education of a prince, you acted as if it were chiefly necessary that he should possess great skill in grammar, and such a knowledge as belongs to a doctor of law; and thus you did waste the precious hours of my youth in the dry, unprofitable, and never-ending task of learning words!" Aurangzeb admired Abul Fazl's rationalism and advised his sons to read carefully the contents of the scholar's work; though not to be influenced by his agnosticism. François Bernier, *Travels in the Mogul Empire*, 1656-68, reissued and annotated by

A.Constable, New Delhi, 1968, pp.155-56. I am grateful to the late Prof. Athar Ali for this reference as well as for his help in formulating the arguments here. I am also grateful to M. Noé Peyré, a Research Scholar in Philosophy Ecole Normale Supérieure, for explaining the finer details of Descartes and Gassendi to me.

14. Charles Elgood, *Safavid Medical Practice*, London, 1970, pp.130-31; vide R.K. Husain, Danishmand Khān, PIHC, 1997.

15. This feat was to be achieved by an unknown French speaking Swiss officer named Antoine Polier almost a century later. Sir William Jones would borrow his copy and then for a year, nothing would be heard of it. W. Jones could not understand them except the Atharva Veda. To overcome this deficiency he established the Asiatic Society of Bengal. If the French so desire, they can still claim the origins of the ASB as having been prompted by them! See details in Jean-Marie Lafont,"The Quest for Indian Mss by the French" in his *Indika - Essays in Indo-French Relations, 1630-1976*, Manohar-CSH, New Delhi, 2000, pp.90-118.

16. Sachau, tr. *Alberuni's Indica,* ed. Qeyamuddin Ahmad, NBT, 1982.

17. See again, Lafonte, *Indika*, op.cit.

18. Both bear the same number i.e. Ms No. AMC-158, IOLR, London.

19. Muhammad Raza Ansari, *Bani-i Dars I Nizami*, Nami Press, Lucknow, 1973, passim.

20. F.C. Robinson, *The Ulema of Firaṅgī Mahall'- Islamic Culture in South Asia*, Permanent Black, New Delhi, 2001, pp.42-43.

21. E.g. Jamaluddin Inju's *Farhang i Jahangiri*, Ms. in AMU Library, is a technical dictionary. Then there are the numerous *Dastur-ul Amals* scattered all over the world in different collections and which tell the reader ways of measuring land, applying tax rates, sowing different crops, and some have information on military organisation too.

22. Though their titles are misleading and could even be erotic, e.g. *Sawarin-i Barahin* or the 'Ride of the Naked". See Ms in University Collection, Central Library, Aligarh.

23. See *Biyaz of Nawab Mureed Khan,* SP 318, Bib. Nat de Paris; the *Biyaz of Shah Mirza* (Ms. No. Ethe 412 IOL; the *Biyaz i Khushbui*, Ms 828, IOL; the *Biyaz* in the Raza Library, Rampur; to name a few. See also I.G. Khan, 'The Elites and the Question of Technical Innovation in 18th Century Northern India' in Richard Barnett, ed. *Rethinking Early Modern Indian History*, Manohar, Delhi, 2002. (Expected).

24. Ms No M88, ASB Collection, Calcutta; See also Irfan Habib, ed., *Confronting Colonialism - Essays on Hadar Ali and Tipu Sultan,* New Delhi: Tulika, 1999. I am grateful to Jean-Marie Lafont for the information on the boring machine.

25. See *Dastur ul Amal, Ms. No.* Or. 1771, IOL, See also *Khazanatual 'ilm,* Habibganj Collection 45/11, AMU, as well as *Mukhtasar al Mufid*, ms no. 892, KBOPL, Patna.

26. Waliullah, *Tarikh-i Farrukhabad*, tr. W. Irvine as 'The History of Farrukhabad', *JASB*, 1878-79.

27. Irfan Habib, 'Akbar and Technology' in Irfan Habib, ed, *Akbar and his India*, OUP, 1997.

28. M.A.Alvi, Rahman, Verma and Ghori and al., *Science and Technology in Medieval India- a Survey of Persian, Arabic and Sanskrit Manuscripts*, INSA, New Delhi, 1980. See also I.G.Khan,"The Social Context of Mughal Technical Literature, 1500-1750.", Paper read at the Conference on Persian Sources on India, MSH, Paris, April, 1993. Another excellent source is the more general Storey's Persian Literature-a Biobliographical Survey as well as Ethe' and Rieu's *Catalogue of Persian Manuscripts* in the India Office Library and the British Museum respectively.

29. See Charles Stewart, *Memoirs of Hyder Ali Khan and his son Tippoo Sultan* (in a descriptive catalogue of the Oriental library of the late Tippoo Sultan), Cambridge, 1809. For the Afghan chief's books there was simply a handlist made by Sprenger and it is kept in the India Office. The books were half lost because they had been dumped in the Armory in Lucknow in 1775. See *Catalogue of the Arabic, Persian and Hindustani Mss of the library of the King of Oudh,* Vol.I; Sprenger also wrote a 'Report on the Library of the King of Awadh'. In this he reported that the Topkhana Collection containing the books from Hafiz Rehmat Khan's library was looted in 1814.

30. See Proceedings of the conferences convened by Dr A.R. Bedar, Director, KBOPL, Patna, on the Mss on Science and Technology in various libraries across South Asia.

31. I.A.Arshi, *Catalogue of Arabic Manuscripts in the Raza Library*, Rampur. This rich collection is now once again freely accessible after the Inquiry.

32. Adeeb, Shahan-i Awadh, in *Nazar-i Zakir*, p.126

33. Abdul Latif Khan Shustari, *Tuhfat ul Alam*, pp. 349-50.

34. J.M. Lafont,"The Quest for Indian Mss", *Indika*, passim. Another tragic and befell the huge Farsi and Arabic mss collection of the Franco-Anatolian named Raymond educated at the Collège Louis le Grand in Paris, and translator of the *Siyar al Mutakherin*, namely Haji Mustafa alias Nota Manus. His footnotes in the translation are a historical text in themselves. Ironically enough, Haji Mustafa was looted en route to Mecca after he had accepted Islam and was performing Haj.

35. Muhammad Raza Ansari, *Bani-i Dars i Nizami*, Lucknow.

36. On Delhi at the death of Shah Waliullah, see M.Khalid Masud, 'The world of Shah Abd al Aziz in Jamal Malik ed. *Perspectives of Mutual Encounters in South Asian History, (1760-1860),* Brill, Leiden, 2000, pp.298-314. See also Naeem Ahmad, *Shahr-I Ashob*, Maktab Jamia, Delhi, passium.

37. Francis Robinson, The Ulema of Farangi Mahall, pp.46-50.

38. *Maasir Ul Kiram*, pp.222-223, vide Umar, *Islam in N.India*, 1993, pp.288,305.

39. In fact, most student s of the *Firaṅgī Mahal* found jobs as legal assistants to lawyers and later as native judges in the lower courts where Muslim law was to be combined with Company Regulations. See explanation for their suitability in J.R.I. Cole, *The Roots of North Indian Shi'ism in Iran and Iraq, Religion and State in Awadh, 1722-1859,* UCP, Berkeley, 1988, pp.25-45. On the legal history of this region, see also Radhika Singha, *Law and Society in 19th Century N. India*, IUP, New Delhi, 1998.

40. Mohammd Mujeeb, *Indian Muslims,* London, 1967, vide Cole, *Roots*, p.44. Ansari, *Bani i Dars i Nizami*, pp.259-278. S.A.K. Ghori,"Mathematics and Astronomy in India the 18th and 19th Century", Paper read at the First National Workshop on Science and Technology in the 18th Century, INSA, New Delhi, 1972. Mr Ghori, a retired teacher, lived in Aligarh till his death in 2002. He could recite the titles of all the prescribed texts in his old madrasah and could trace his lineage to the disciples of Ibn Sina!

41. S.A.K. Ghori, op cit, p.215.

42. Vide J.R.I. Cole, *The Roots of N. Indian Sh'ism*. pp. 25-45. See also F.Robinson, *The Ulema of Firaṅgī Mahall*, pp.50-54.

43. Incidentally the problem of young men running away to study in Lucknow was so endemic that there was a standard proforma in some of the letter-writing guidebooks on how to seek the intervention of a powerful *ijaradar* like Tikait Rai to make their sons leave his *madrasa* and to return to the village home! See proforma of a letter in Nisar Ali, *Insha-i Dilkusha*, Nawal Kishore, Lucknow, 1878 (the manuscript dates to the 1790s.See also note on the help given to students by Tikat Rai in Najmul Ghani, *Tarikh-i Awadh*, vol.2, pp 133,137; see also *Tarikh-i Farah Bakhsh*, tr. Hoey, vol I, p.133. And other such sources in Farsi, printed and mss. forms.

44. See documents on these *madad-i ma'sh* grants in the 'Acquired Collection' of the National Archieves of India, New Delhi, e.g. Acqd No 281 relating to Sandila. Then there are local histories on Saiyid towns such as the *Jami al Barakat* on Bilgram. Ms No 2572, NAI, Delhi. A good amount of information on the chief families is also to be found in Patrick Carnegy, *Notes on the Races*, etc, Lucknow, 1868; R.M. Martin, *Eastern India*, vol II, pp.431-32, has information on the rationalist teachers of Gorakhpur. And there are numberous such references to the *qasba* families and their culture. C.A. Bayly, *Ruleers, Townsmen and Bazaars,* CUP, 1983, was one of the first to draw our attention to this culture of the *qasba.* In fact it was the youth from these *qasbas* who went on to constitute the bulk of the recipients of early western education at Allahabad, Lucknow and Aligarh. It was this group that provided the secular leardership to both the Congress and to the Muslim League. They also

provided the ideology of a secular and socialist India even as the National Movement was coming into its own and it was the poetry of Insha, Zauq, Mir, Chakbast, and later Jan Nisar Akhtar, Majrooh Sultanpuri, Rahi Masoom Raza, Majaz Lakhnavi, Kaifi A'zemi, Sardar Jafri, and Akhtar ul Iman that grabbed the imagination of pre-as well as post-Independance India's youth through the medium of their poetry and their film songs. Kaifi Azmi was among the last of this group to pass away in 2002.

45. M.M.Askari and Rafi, eds, *Kalam-i Insha*, Allahabad, 1952.

46. These were the offspring of the Persianised Hindu Kayasth Clerical class, the Saiyid Maulvis, the Shaikh scholars. They went to provide the youth for the Indian National Congress in 1885 and then the Muslim element went on to start their Muslim League. See detailed histories by Bipan Chandra, Sumit Sarkar, Ayesha Jalal, K.N. Panikkar, Stanley Wolpert, et al.

47. George Forster, *Journey from Bengal to Britain*, Vol. I, pp. 155-57.

48. 'Tout le mode étoit officier; personne ne vouloit être soldat...Ce mélange bizarre ou plutôt monstrueux eut gâté la meilleure composition du monde. *'Voyage en Inde du Comte de Modave*, ed. Jean Deloche, Paris: EFEO, 1971, p.155. Modave is an aristocrat who has intrinsically nothing but contempt against the French commoners serving the Indian States, who (most of them at least) and left the French service because of the reaction *nobiliaire* in France. Modave especially hated the fact that he had become on of these "*aventuriers*", and sometimes served under them or depended on them, as he depended on Medec while staying at Gohad and Delhi. This Modave hated, hence his derogatory description of them. In the meantime, as a military professional, he couldn't help acknowledging their excellent professional work as in the case of gun-casting and fire-arms making. This contradiction has not yet been felt nor acknowledged by most of the historians. I am grateful to Jean-Marie Lafonte for this insight.

49. All these activities have been briefly dealt with in Rosie-Llewellyn Jones, *A Very Ingenious Man, Claude Martin in Early Colonial India*, OUP, New Delhi, 1992, the chapter entitled 'The Polymath'; better still is her article "Un Lyonnais de l'Esprit des Lumières", in *L'Extraordinaire Aventure de Benoît de Boigne aux Indes*, C&D, Paris, 1996, pp.87-92.[Iqbal, keep chronology in mind : Asaf -ud-Daula could not know whether Martin knew all these things in 1775 since for example hot hair balloons were first launched by the Montgolfier brothers in 1783. Same observation concerning electricity. JML]

50. Information provided in J.M.Lafont, "The Inventory of Claude Martin's Goods found in the Constantia, the Farhat Bakhsh, and at his indigo farm at Najafgarh". Paper read at the Colloque Claude Martin, Department of History, University of Lyon, Oct 27th 2000.

51. Rosie L.Jones, 'The Road to Najafgarh', read at the same colloque, ref. 50.

52. For details of this Correspondence, see Neena David,'Confidante to the Last', also in the same colloque ref. 50.

53. A.R., Vol.I, pp.332-335, article dated May 1788. The desire to be a part of a 'learned journal' or society was an intense desire among the men of l'Age Lumière.

54. R.L.Jones,'The Road to Najafgarh', Paper read at the Colloque ref. 50.

55. M.H.Rizvi Adeeb, *Shahan i Awadh ke Adabi o Ilmi Karname* (in Urdu), in *Nazr-e Zakir,* Lucknow, 1960, p.178.

56. The canon with this information now sits in front of his mausoleum, the Constantia palace in Lucknow, now known as La Martinière College, Lucknow.

57. On De Boigne, See Desmond Young, *Fountain of the Elephants*, 1959, also other works on De Boigne mentioned in footnotes elsewhere in this paper.

58. See details in Najmul Ghani, *Tarikh-i Awadh,* Vol.III, pp 147, 296-7.

59. Polier was a Franco-Swiss trader and civil engineer who worked for variety of north Indian rulers. A recent book on him is Muzaffar Alam and Seema Alavi, The Mughal Orient, OUP, Delhi, 2001. On de Boigne, see *L'Extraordinaire Aventure de Benoît de Boigne*, C&D Paris, 1996. On Madec, Rheinhart, Chevalier, Raymond, and other such French mercenaries working for different regimes across N.India, see Rose Vincent, *The French in India,*Orient Longman; on Pons, Boudier, Danet, and other such astronomers and cartographers working for Raja Jai Singh as well as for their own Jesuit missions in India, see Razaullah Ansari's works on 18th century astronomy in India. See also the work being done on the Jesuit scientists in India by Dhruv Raina at NISTADS, New Delhi. On Tieffenthaler's *Atlas*, see French edition by Bernoulli, London.

60. Heber, *Travels in India, c.1824, ed. Laird,* p.120.

61. The Album has been completely published by Valérie Bernstein. See also Susan Gole's publication of the Album in *Indian Maps and Plans*, Manohar, 1989. Also an excellent description of his entire collection is to be found in Mildred Archer, *Company Paintings, Indian Paintings of the British Period*, V&A, London, 1992, pp.113-120.

62. Ms No SP 2078, Bib Nat. Paris.

63. Ms in KBOPL,Patna.

64. Ref in Rizvi, *Shahan i Awadh...*, in Nazr-i Zakir.

65. Twining, *Travels in India*, London, 1893. p.313.

66. Rosie L. Jones, *A Fatal Freiendship,* OUP, New Delhi, 1984, p37.

67. Twining, *Travels...*, p.167; see also William Hodges, *Travels...., p.102.*

68. On the Aligarh fort, see Jean-Marie Lafont's article and photographs in *Reminiscences: The French in India*, and several other publications on forts in general, such as Lafont's *CHITRA: Cities and Monuments of Eighteenth Century India from French Archives*, OUP, New Delhi, 2001. Also see J.M.Siddiqui, *Aligarh -a L'Extraordinaire Aventure de Benoît de Boigne*, C&D, Paris, 1996. On the Italian origins of the star-fort design, see R.A.Jairazbhoy, *Islamic Architecture*, Ferozesons, Lahore, 1999.

69. See details in Shustari's *Tuhfat ul Alam* vide M.H.Rizvi, *Shahan-i Awadh..., Nazr-i Zakir*, p.165.
70. See 'Seir al Mutakherin' Lucknow, Nawal Kishore Press, 1886, Vol.III.
71. *Kitab Amoz al Munshi*, Ms No SP 820, BN, Paris.
72. *Waqiat I Azfari,* vide Mohd Umar, *Urban Culture,* p.10.
73. Bishop Heber, *Narrative of a Journey*, Vol. II, p.91.
74. *Sprenger to Elliot, Foreign Secret Correspondence,* GOI, dt. 13 March 1843.