

## Reason, science and religion: gleanings from the Colonial Past

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In modern times reason has become the kernel of what is known as modernity. It refers to critical consciousness and the spirit to interrogate everything. Modernity and science go together in our age, and science is taken as the supreme expression of man's rationality. Unfortunately in the colonized countries science first came to be known to people by its products rather than as a system of ideas. Even today, science in many societies continues to be identified with weapons, aircraft, telephone and so on. Similarly, scientific institutions are modern icons. These came to India as part of the colonial baggage and soon became the carriers of new ideas and in fact symbolized modernity itself. Was it a smooth process? Quest for knowledge has never been alien to Indian society. And there were institutions in pre-colonial times too. What new changes came in the nineteenth century? Can these be explained in terms of metropolis – periphery relationship or impact/response studies? Did the process of ideational exchange and institutionalization differ in colonial and non-colonial settings? How to 'straddle the spatial and epistemological divide' between metropolis and colony? Was this a one-way transfer? One can add, was this knowledge merely or largely derivative? Could it produce autodidacts or intellectual-migrants who could hold on their own? Is indigenous 'original and unsullied' to be seen mostly in opposition to modern/scientific knowledge? Could they interact; could they change? Was a synthesis or co-production possible? What is more, could emphasis on reason and science lead to a more tolerant society or caused more friction in a traditional, orthodox society? The present note attempts to address these questions with the help of examples and illustrations from India's colonial past.

### The inheritance

Eighteenth-century India inherited a long-lived tradition in both philosophical and material terms. Centuries before, Said al Andalusi (1029–70), in his *Tabaqat al Uman* (probably the first work on the history of science in any lan-

guage), referred to India as the first nation that cultivated the sciences<sup>1</sup>. Later, India adopted post-Ghazali Islam, which was marked by a bitter theological opposition to *falsafa* (philosophical rationalism). Knowledge in the Islamic framework was divided between *ilm-al-Adyan* and *ilm-al Dunya*<sup>2</sup>. Accordingly, Muslim scholars were divided into those who relied on *manqul* (traditional knowledge) and those who favoured the touchstone of reason (*maqul*). The former, greater in number and more powerful, opposed Sultan Muhammad Tuglaq (1325–51) when he tried to patronize *ilm-I-maqulat*. However, Mughal India was somewhat eclectic, and because there was no consolidated, systematic and detailed curriculum, the channels of learning were not at all closed to *maqul* ideas<sup>3</sup>.

Another important aspect that needs to be taken into account is the caste system, which has always been a unique feature of Indian society. P. C. Ray was the first historian of science who saw in the caste structure 'something that made science a prey to creeping paralysis'<sup>4</sup>. Caste led to the ruinous separation of theory from practice – of mental work from manual work. Ray wrote as follows:

The intellectual portion of the community being thus withdrawn from active participation in the arts – the how and why of phenomena – the co-ordination of cause and effect – were lost sight of – the spirit of enquiry gradually died out. Her (India's) soil was rendered morally unfit for the birth of a Boyle, a Descartes, or a Newton<sup>5</sup>.

In eighteenth-century India this paralysis was compounded by an enormous intellectual (cultural) failure on the part of the ruling class. Jai Singh had attracted several scholars to his court, but he never thought of establishing an institution that would continue and improve on his work. It was a curious situation. On the one hand, one finds Mushibullah al-Bihari writing *Risalah Juz 'la Yatajazza*, an Arabic treatise on the indivisible atom, and two other texts on motion and time (1700); on the other hand is Walih

Musawi (1700–70) writing *Murgh-namah* (on cock fighting) and *Kabutar-namah* (on pigeons)<sup>6</sup>. As the British strengthened their grip at the end of the eighteenth century, the Indians did not continue this withdrawal. As interaction with the West grew, Indians did try to look out and look within. For example, in 1790 Mir Hussain Isfahani wrote *Risalah-I-Hai'at-i-Angrezi*, a Persian text on European astronomy<sup>7</sup>. Many commentaries were written during this period; although they did not entail a paradigmatic change, neither were they slavish. In fact, composing commentaries were written during this period; although they did not entail a paradigmatic change, neither were they slavish. In fact, composing commentaries was considered a civilized form of making progress<sup>8</sup>. In several instances (especially in medicine) these commentaries explain scientific knowledge in terms of its own rationality and logic, but in the final analysis when the validity of certain knowledge was put to test, the sacred texts were always the standard measure. More than three hundred years before P. C. Ray, Abul Fazl had mourned 'the blowing of the heavy wind of *taqlid* (tradition) and the dimming of the lamp of wisdom... The door of "how" and "why" has been closed; and questioning and enquiry have been deemed fruitless and tantamount of paganism'<sup>9</sup>.

This was true not only of late Mughal India, but the Safavids in Iran, the Manchus and the mighty Ottomans had also begun to show signs of crack. Some resurgent nations, now ruling the waves, came in and through their trading companies chalked out large areas. Their sails, their guns, their training were substantially different. They had 'new' knowledge behind them. In the midst of political intrigues, plunder and numerous local wars, some official of the East India Company could think of establishing a forum for knowledge (The Asiatic Society, 1784) and a college at their fort (Fort William College, 1801). Trained surveyors marched along with their armies. The British could succeed against their numerically superior adversaries largely because they possessed a thorough and scientific knowledge of the

country through which they marched<sup>10</sup>. Survey and expansion moved side by side. Every boat that touched the Indian shores had a medical man on-board. Trained in the scientific seminaries of Scotland and northern Europe, he would be known as surgeon-naturalist: and true to his training, in his spare time, he would look for and report on the topography, minerals, flora, fauna and people of his area. They were scientific soldiers who willingly and promptly extended the help of 'new' knowledge to the process of colonial expansion and consolidation.

Thus was born the phenomenon of 'colonial science'. In some ways, it did represent an advance over pre-colonial science. It was far more systematic, methodical, penetrative and pervasive. It involved everything: science, politics, commerce, military operations, administration, etc. In any case it is now widely acknowledged that techno-scientific developments and colonial expansion had closer links<sup>11</sup>. These links beg certain questions. Can there be an imperialist side to the core of natural knowledge? What was the shape that 'modern' and 'universal' science took in a colony? What was the colonial posture in science and to what extent were scientific discourses used to achieve political and cultural goals? No less important is to glean how the recipient culture sought to appropriate or redefine the metropolitan ideology of science. How was the indigenous scientific tradition perceived? How did the indigens react to the introduction of 'new' 'knowledge and new tools? Was a synthesis possible? Finally, could the integration of technological and scientific tradition have taken place as part of the natural evolution of the Indian society had colonization not intervened?

Clear-cut answers are difficult to attempt, for colonialism was no monolith and it left several facts and questions open which can be interpreted either way. Yet one thing is certain; colonial knowledge, its science and its rationale lacked sovereignty. Its contours were of course drawn on the colonial terrain, but it enjoyed a rather limited autonomy which was further reduced as the colonial grip tightened. Several colonial scientists felt uncomfortable, yet they had to perform a dual role—to serve the colonial state and to serve science. This state claimed superiority in terms of structure, power, race, etc. Science

claimed superiority in terms of knowledge and inter alia helped the colonial state dismiss 'other' epistemologies. Both needed each other and became mutually dependent.

An important feature of the nineteenth century India was the almost total absence of pure or theoretical research. Research activities in science like physics and chemistry which had by then 'reached' a professional stage' in Europe, were hardly noticeable in India. In the *Centenary Review of the Asiatic Society*, P. N. Bose apologetically wrote: 'Our chapter of chemistry at the Asiatic Society is near being as brief as the proverbial chapter on Snakes in Ireland'<sup>12</sup>. Till the advent of P. C. Ray, only one chemical paper had appeared – by A. Pedler on the volatility of some of the compounds of mercury<sup>13</sup>. There were chemical analysts in every province, but their job was confined only to medico-legal cases and the inspection of government stores. India was found suitable only for field research. She was in fact used as a 'vast storehouse' with exotic varieties of flora, fauna and minerals which were to flood the European laboratories for many years to come. The real research was thus to be done in the metropolis. India could get only ancillary units. And this happened in a century when England itself was undergoing a phase of transition wherein professional scientists, the government and industrialists who understood the full potentialities of science, were all attempting the difficult task of integrating science into the English government, industry and education. In India the story was, however, different. Here scientific explorations brought the government, science and economic exploitation into a close relationship. But the Indians and India's interests were left largely in the cold.

### New articulations

The Indian response can best be understood in terms of a cultural encounter that was initially disturbing, even agonizing. Gradually the colonizer-colonized relationship stabilized and the recipients started examining what was living and what was dead in their system, and, under the new circumstances, what to accept and what not. The encounter also had within it the question of attitude (towards each other), an uneasy accep-

tance, a quest for identity and, finally, the seeds of decolonization.

The urge to comprehend the modern knowledge and tools that the colonizers had brought, and to assimilate them, was definitely there. This urge came from within, and the acculturative influence of European thought and Christian liberalism strengthened it. Even the commercial class realized the importance of new knowledge. Leading Bombay merchants like Manekji Curserjee and Jagannath Sunkersett viewed Western arts and sciences as a commodity, easily transported and, when acquired, easily adopted for use like any other material goods. The new interlocutors did put a premium on alien rule, and in a sense idolized it and supported downward filtration. They had to do this the more so because initially they could think of no other effective way to deal with the serious ills their society was suffering from. They experienced a dual alienation (a la Cabral) from the traditional and later from the colonial life and system<sup>14</sup>. They could to some extent anticipate the distortions the colonial medium was likely to produce. But the realization was slow and diffident. Perhaps this explains why Rammohun Roy (1772–1833, Calcutta) looked to both Vedanta and the West<sup>15</sup>. Ishwarchand Vidyasagar (1820–91, Calcutta), an admirer of Western knowledge, wanted Indian students to study their own 'false system' also<sup>16</sup>. Bal Shastri Jambhekar (1802–46, Bombay) commenced his science popularization activities in both Marathi and English<sup>17</sup> and Master Ramchandra (1921–80, Delhi) began his mathematical treatise from a twelfth-century Indian text, Bhaskars's *Bij-Ganita*<sup>18</sup>. All of them exemplify a cross-cultural mentality and creative encounter. The soil was being prepared for cross-fertilization, and the seed was a cross-breed.

Rammohun Roy and Vidyasagar were great social reformers. Unlike them, Bal Shastri Jambhekar and Master Ramchandra concentrated on mathematics teaching and science popularization. Jambhekar was the first Indian to become a professor of mathematics and astronomy. He taught at Elphinstone College, Bombay, and among his early pupils was Dadabhai Naoroji, the doyen of Indian nationalism. Jambhekar worked for science learning through the local Marathi language. In 1836, he published the Marathi translation of a well-known

English work on mathematical geography, to which he added an 'Essay on the system of Bhaskarcharya'. In 1942, he published in Marathi two books on the theory of equations and differential and integral calculus. A little later in Delhi, Master Ramachandra tried to revive the Indian spirit of algebra so as to resuscitate 'the native disposition'<sup>19</sup>. Bhaskar was common to both. To begin with one's own heritage was quite natural. Indeed, this was the strategy advocated by the orientalist as well. L. Wilkinson, a British Resident and an astronomer at the court of Rewa, found Bhaskara's works 'beyond all comparison, the best means of promoting the cause of education, civilization, and truth amongst our Hindu subjects'<sup>20</sup>. Ramchandra, however, moved ahead and incorporated the post-Bhaskara 'advances' in his treatise on the problems of maxima and minima, published in 1850. His idea was to bridge the gap. But the efforts aborted. An alien government confident of its epistemic superiority (especially after Macaulay), would not allow the transplantation of modern science on an indigenous base<sup>21</sup>.

Another interesting dimension of these 'early stirrings' was that both Jambhekar and Ramchandra took to science popularization through the Indian languages. Both worked for their respective Native Education Society and published journals (the *Bombay Durpan* in English and Marathi, and *Mohabb-e-Hind* in Urdu). Both were avid translation enthusiasts. In a meeting organized by the Delhi Education Society on 'Learning European Knowledge through Translations' on 12 November 1867, an English priest argued that no society had gained knowledge through translations, to which Ramachandra replied that Europe was enriched through translations as the centres of science had shifted from Greeks to Muslims<sup>22</sup>. What Ramchandra probably did not realize then was that the translations in the Arab and the Mediterranean culture area were accompanied and often preceded by original research. The subsequent years were to prove the priest more correct, as the translation activities of Master Ramchandra and his more illustrious contemporary Sir Syed Ahmad (and the Aligarh Scientific Society) were to end on a feeble note.

The most important characteristic of mid-nineteenth-century Indian thinking was an unprecedented emphasis on cultural synthesis. Akshay Kumar Dutt, a

contemporary crusader, worked for 'Indianizing Western science'. Numerous journals of the period (like *Samvad Prabhakara*, *Tatva Bodhini* and *Vividharta Samgraha*) claimed the same objective. The idea of a cultural synthesis gave them the best of both worlds. First, it enabled them to absorb culture shock and also promised a possible opportunity to transcend the barriers imposed by colonialism. Moreover, it also fitted well with the dominant Hindu doctrine of epistemological pluralism<sup>23</sup>. So the clamour for cultural synthesis grew. Bacon and Comte impressed the Indian mind. But how to integrate their experimental method and rationality into the Hindu 'science of spirit'? This the local thinkers were not clear about. They pursued a great variety of strategies – imitation, translation, assimilation, 'distanced' appreciation, and even retreat to isolation – but without much success. The search for synthesis remained, elusive, yet it did accelerate the quest for identity.

During 1860–80, a number of cultural essayists tried to articulate modern scientific rationality in terms of indigenous traditions and requirements. Bankimchandra, a Bengali novelist of high intellect and repute, for instance, wrote on *Vijnan Rahasya* (secrets of science), which appeared in *Banga Darshan* during 1865–70. With the help of John Tyndall's *Dust and Disease* he wrote *Dhula*, and T. H. Huxley's *Lay Sermons* was utilized in *Jaivonik*<sup>24</sup>. There are a number of direct references to Comte in his literary as well as discursive writings (for example, *Debi Chaudhurani* and *Dharmatatva*)<sup>25</sup>. These forays sometimes led Bankimchandra to return to certain ancient theological concepts. In 1873 he rejected the Hindu concept of Trinity as an aberration, but in 1875 he found it close to Darwin's theory of natural selection. Hindu spiritualism finally sucked up many who ventured to travel outside its orbit. Islamic progressives faced a similar situation and fared worse. In 1877, one Maulavi Ubaidullah wrote:

The Mahomedans with their philosophy are exactly in the position of the school men of Europe, that is they have travelled half way towards actual civilization: consequently when the modern reformed philosophy of Europe once gains an entrance to their minds, they will be able to

make more rapid progress than their neighbour Hindoos. Among us a Newtonized Avicenna or a Copernicized Averroes may spring up, who may be able to criticise even sons of Sina and Rushd<sup>26</sup>.

The lure of inching towards 'actual civilization' and the hope of producing 'a Newtonized Avicenna or a Copernicized Averroes' present a curious mix of both self-criticism and a yearning for change (and also a hope perhaps yet to be realized).

The theme of the identity of the colonized on its own terms (that is, away from what the colonizers thought about or dictated) also contained the seeds of decolonization. An imperial rationalist discourse showed Indians how rationalism could be turned against the Europeans themselves. Rationalism was seen as something inherent in human nature rather than a European 'speciality' and as a mark of progress independent from Europeanization. Gradually colonialism came to be viewed as a cultural invasion of space, to be ended, neutralized and rolled back<sup>27</sup>.

Did the Indian elite by presenting Europe and its ideas as a distinct and definable entity contribute to the emergence of a belief which held India 'somehow inferior'? Perhaps not. They did not see Europe as Asia's other. They neither emphasize nor de-emphasize the shared inheritance of mankind. They leave these questions open. Admiration for the West was at no point unqualified. But they did accept what struck them as rational and useful. For example, Ram-mohan talked of Europe's mastery over 'useful sciences', while Indian knowledge systems were conditioned by pre-Baconian medieval scholasticism; Jambhekar wrote in a similar language. He added useful arts, connected with the 'common purposes of life'.

### Reason and religion

Religion of course comes as a major obsession in almost every type of encounter, political, social or cultural. When a Scientific Society was established in Bihar, its principal objective was to enable 'the inhabitants of India learn the Western Science together with those of their Religion with ease and facility'<sup>28</sup>. But this Society did not

encourage religious fanaticism. Its founder, Imdad Ali, cites an instance,

Syed Ahmed of Bareilly (1820 styled as Imam Homan) used to collect money for Jihad and declared Hindustan as Dar-ul-Harb (Country of infidels). He was killed fighting in the Punjab. After his death his followers made a statue of leather which was placed on the top of one of the hills of Afghanistan, and showed to the people from a distance, saying that the Imam of Jihad was still living. By this trick they continued for a long time to collect immense sums of money to carry on Jihad. . . May god preserve all mussalmans from the snare and fraud of these misguided and bigoted men<sup>29</sup>.

Probably the best example of those who tried to synthesise reason with religion is Sir Syed Ahmed. He wrote:

The Qur'an does not prove that the earth is stationary, nor does it prove that the earth is in motion. Similarly, it cannot be proved from the Qur'an that the sun is stationary. The Holy Qur'an was not concerned with these problems of astronomy. . . the real purpose of a religion is to improve morality<sup>30</sup>.

Here is the crux of Syed Ahmed's belief: 'the real purpose of religion is to improve morality'. Let scientific truths be established by observation and experiment, he says, and not by 'attempting to interpret a religious text as a book of science'. This articulation was significant. It defended new knowledge from obscurantist attacks in the name of religion and tradition and at the same time protected the indigenous culture and beliefs from the colonial and evangelical onslaught. Sir Syed's associate, Munshi Zakaullah, was even more emphatic. He wrote, 'God has given human beings the ability called reason to discover and comprehend the real world, and the application of this ability by the human beings leads to the creation of knowledge'. To drive home the point he added, 'reason is to knowledge what sun is to light and eye to vision'<sup>31</sup>. Another important contemporary, Jamaluddin Afghani, did not see any disjunction between Islam and science. He rather blamed the *mullahs* and *maulvis* who

were filled with superstition and vanity. To him the *ulema* represented a narrow wick topped by a small flame that neither lights its surroundings nor gives light to others<sup>32</sup>. However, this does not mean that he accepted new researches emanating from the West. Whereas in India in 1881, Afghani wrote *Al-Raad al Dahriyyin* (The Refutation of Materialists to counter the spread of naturalism, i.e. *naychariyya*). He presented his opposition to Darwinism in a simplistic way. He argued 'it would be possible that often in the passage of centuries a mosquito (barghuth) could become an elephant and an elephant, by degrees, a mosquito'. He cited Darwin's illustration of how the continuous cutting of dog's tail for several centuries would produce a new generation of dogs without tails, and he related this to the Semitic practice of circumcision: 'Arabs and Jews have for several thousand years practiced circumcision, and despite this until now, not one of them have been born circumcised'<sup>33</sup>!

When an Oriental Faculty was proposed in 1885 at the Allahabad University, a petition drafted by Sir Syed was submitted. It enquired:

We wish to know what benefit will the University confer on the public and eastern sciences by establishing an oriental faculty, or to what use will it turn the eastern sciences and arts at the present day. We believe that an oriental faculty can do no good – secure no advantage to the public. It will only waste the time of those who may unfortunately fall into its snare – it may further be of use in helping to *fasten the hood of ignorance* tighter round our eyes or to precipitate our fall who stand dangerously on the brink of the abyss of darkness and ignorance.

To prove our statement conclusively we shall enumerate the various branches of oriental learning and try to discover which branch or branches does the University of Allahabad propose to particularly direct its attention.

Is it to be astrology? – a science that teaches us the good or bad influence of the stars: informs us of the auspicious or inauspicious hours. Certainly its cultivation will give pre-science to the Government and enable to manage the affairs of the country

much better; while the people, knowing previously their own destiny, shall feel contented, and instead of grumbling at the conduct of the Government, they shall have to complain of their own ill fate.

Or is it to be astronomy? No doubt, if such be the case, the object is to revive the old Greek speculations on astronomy. And we shall see in our colleges the doctrine of Ptolemaic system taught over again, and find the illustrious names of Newton, Copernicus, and Kepler banished from the country for ever<sup>34</sup>.

In sharp contrast to these sentiments, exactly 50 years ago (in 1835) more than 8000 Muslims of Calcutta had submitted a petition complaining against a deliberate decimation of oriental knowledge and pleading for its survival:

Now some men utterly ignorant of the literature and science of Arabic and blind to its beauties and advantages have conceived the project of destroying the Madrasah, and causing the science of Arabia to cease, at which men and all subjects of the state are in a ferment of agitation and despair<sup>35</sup>.

Perceptions no doubt were changing fast. Earlier Hindu social reformers have been referred to. By mid-19th century Indians exposed to modern medical knowledge began asserting. S. C. G. Chuckerbutty, the first Indian to join the coveted Indian Medical Service, wrote,

The Brahmanical system may be a very praise worthy exercise of self-denial but the philosophy it inculcates is a verbose and distorted philosophy, which consumes itself in its study and leads to no practical results. The Mahomedan system of education though hampered by no distinctions of caste, is nevertheless as defective as the Hindu. In this school lads are made to learn by rote voluminous compositions and these are mostly books of fable or of a dreamy morbid philosophy<sup>36</sup>.

Another doctor, Mahendralal Sircar who established the Indian Association for Cultivation of Science in 1876, criticized the Hindu ethos as 'a chaotic mass of crude and undigested and unfounded

opinions on all subjects, enunciated and enforced in the most dogmatic way imaginable' and this, he thought, could be remedied only by 'the training which results from the investigation of natural phenomena'<sup>37</sup>. In the mid-1880s, he treated a popular spiritual saint of his time Sri Ramakrishna for cancer. They discussed *jnana* and *vijnana*, *para* and *apara* (sacred and profane) several times. The saint made it clear that his concepts were related to God and God alone, and were different from the doctor's notions of knowledge and science<sup>38</sup>. Sircar, though a believer, would never accept that *apara vidya* was inferior. He would retort,

What are *para* and *apara* with regard to knowledge? What is higher or lower with revelation of truth? One will have to attain *para* through the *apara*. We can comprehend God, the primeval cause of the universe, more clearly through the truths we know directly from the study of the natural sciences<sup>39</sup>.

On one occasion when Sri Ramakrishna was explaining God with form and God the formless in terms of an imagery, i.e. the cooling influence of *bhakti* (faith) freezing part of the ocean of consciousness into ice of definite shape, and the heat of *jnana* (knowledge) melting away the form of ice into formless Brahman (Ultimate Reality) – Mahendralal was impressed by the scientific part of the imagery and commented: 'Yes. When the sun (of knowledge) is up, the ice melts; and what is more, the heat of the sun turns the water into invisible vapour'<sup>40</sup>.

The saint's famous disciple Swami Vivekanand pondered over the state of his society, critiqued the classical traditions and stressed the need of modern science in India. He interacted with the industrialist Jamsedji Tata and supported his scheme of a research university (now the Indian Institute of Science, Bangalore). He tried to synthesize, 'It is not that the secular and spiritual knowledge are two opposite and contradictory things; but they are the same knowledge in its different stages of gradual development'<sup>41</sup>. He argued,

There have been fights all the world over between secular knowledge with its shining instrument of reason and religious knowledge, claiming infal-

libe authority as its guide. .the essence of religion, the Universal, wedded to reason, would not only survive the onslaught of reason but actually emerge triumphant<sup>42</sup>.

The explanation was not really simple; religion 'wedded to reason', yet defeating the 'onslaught of reason'! A sharper articulation of the cultural dimensions of techno-scientific education came from Ramendra Sundar Trivedi, a science teacher at Ripon College (later its principal) in Calcutta. He wrote a number of thematically-rich yet seemingly popular science articles in Bengali which were published in books titled *Prakriti* (1896) and *Jigyasa* (1904). Trivedi even tried to expand the realm and definition of science.

Science! Science! We all aspire for scientific research. As if science is confined only to physics, chemistry and physiology. As if anthropology is beyond the scope of science – as if historical analysis is outside science's concern (Santanu Chacraverti, unpublished).

Such a holistic view may not be appreciated by the scientists now, but a century ago it was not so. In fact scientists like P. N. Bose and P. C. Ray turned into wonderful historians. But Trivedi was little different in the sense that he was deeply aware of the philosophical issues concerning science, and even then he would deny modern science any epistemic superiority (unlike P. C. Ray). He would rather describe Western scientists in Hindu terms; for example Copernicus as one with *Dibyachakku* (spiritual vision) Newton as a Rishi (sage) and Helmholtz as an *Abatar* (incarnation).

Revivalist streaks were definitely there, more obvious in the Arya Samaj movement in north India. The very first issue of *The Arya* magazine (1882) has an article, 'The Theory of Evolution from an Aryan Point of View'. It argues that the new theory confirms the insight of the ancient *rishis/yogis*. But on why it was not discovered earlier, why secrecy, a writer in *Arya* argues, 'oppressed by successive races of invaders, the people of India have learned that the only means of preserving their sciences is in keeping them in strict secrecy'. Then *rishis/yogis* are declared to be as Newtons, Tyndalls and Darwins<sup>43</sup>. Post-Sir Syed era,

Muslim intelligentsia had begun to discount *maqul* education. Maulana Abul Maudoodi, founder of Jamaat-e-Islam, argued that 'geography, physics, chemistry, biology, geology, economics are taught without reference to Allah and His Messenger and are hence a source of gumrahi' (straying from the truth)<sup>44</sup>.

Despite the gradual hardening of the religious arteries, majority of public leaders favoured a mixing of religion with secular education. The Maharaja of Darbhanga who was known for charity to colleges and universities and who had opposed Gokhale's bill for universal primary education (a benefit that has not accrued even a century later), said,

I hold that an education which does not provide for instruction in the religion of one's forefathers can never be complete and am convinced that a Hindu will be a better Hindu, a Christian a better Christian, and a Mohammedan a better Mohammedan if he has implicit faith in his God and in the religion of his forefathers<sup>45</sup>.

In all official pronouncements the Government appears to play neutral but in reality its officials never lost an opportunity to foment communal differences. They were convinced that the Hindus and Muslims were *opposita natura* and took full advantage of it<sup>46</sup>. In the midst of agitations for national independence and without an explicit government support, the Christian missionaries were busy pursuing their mission. Class-rooms and clinics were their *operation theatres*. Describing an eye-operation camp in 1940–41, at Shikarpur, a British IMS official noted in his diary:

These operations were not done only for the joy of doing good or the fun of doing them, or for their intrinsic worth. They were done as much as anything as propaganda for Christianity. There was more joy amongst the missionaries and mission doctors in the fact that two people in two months had shown some slight interest in Christianity than the fact that 1500/cataract operations and 15,000 other operations had been performed in that time. Another proof of the subordination of the medical and social aspects of the situation to the religious aspects was seen in Sir Henry's refusal ever to have anything

to do with a non-Christian doctor. Many Hindu doctors, applied to come to Shikarpur to learn cataract extraction. All were refused, but nominal Christians from all over the world were gladly accommodated. Many doctors came from America. Sir Henry thus trained his sons and a few local Christian Indians, but no Muslims or Hindus. Medicine was totally subordinate to religion<sup>47</sup>.

Well, the Indian society, like any other, had its own dichotomies and diversities. How did the Indian scientists who were products of modern education, think about science, reason, religion, etc.? Earlier mention was made of Mahendralal Sircar and Ramendra Sunder Trivedi. J. C. Bose was one of the very few who won international recognition both as a physicist and plant-physiologist. He looked to *Samkhya* philosophy and even gave Sanskrit names to the scientific instruments which he had fabricated with great ingenuity. The instrument for recording the contractile response of the plant was christened *kunchangraph* (*kunchan* means contraction), and the appliance used for measuring sectional response was named *shoshungraph* (*shoshun* means suction). These terms, however, soon fell into disuse. A major work of Bose begins with a verse from the *Rigveda*: 'The real is one: wise men call it variously'<sup>48</sup>. On another occasion he described himself as embodying

the Sanyasin Spirit, and India is the only country where so far from there being a conflict between science and religion knowledge is regarded as religion itself. Such a misuse of science as is now unfortunately is evidence in the West would be impossible here. Had the conquest of air been achieved in India, her very first impulse would be to offer worship at every temple for such a manifestation of the divinity in man<sup>49</sup>.

Bose's contemporary P. C. Ray was an *acharya* (savant) in true sense of the term. A fine scientist and a sincere historian, a remarkable teacher, an entrepreneur and a committed social worker, his was a multi-faceted personality. Reason was his forte and he never succumbed to the lures of sainthood. Like an accomplished sociologist he explained the reasons for the decline of science in India

(see ref. 5). He found the Hindu society 'like an immense expanse of an ocean and the divers sects and sub-sects are so many tiny islets scattered about, nay, separated from one another by an unbridgeable gulf'<sup>50</sup>. This gulf bothered him a great deal. Not only at the societal level, but also in terms of ideas and practices, he found the disjunctions strong and brutal. As he lamented:

Our excellent friends, the Hindu revivalists, will talk by the hour on the transcendental truths and sublime thoughts in the *Gita*, and deliver elaborate discourses on the catholicity of Hinduism and its superiority over all existing creeds; will condemn untouchability in unmeasured terms and so on. When, however, it comes to carrying the precepts into practice, they are the first to show the white feathers<sup>51</sup>.

His quest for 'a broad culture and wide outlook' made him pedagogically relevant too. He resented narrow specializations and rule of the experts. Specializations of course have the advantage of exactness and focus but they may also entail pedantry and 'intellectual myopia'. 'Off his own branch, the specialist is often as helpless as a new born babe. Hence the necessity for a broad culture and wide outlook'<sup>52</sup>.

An encounter reminiscent of the Mahendralal – Ramakrishna dialogue took place in 1939 between Meghnad Saha and Anilbaran Ray. Saha was criticized for his critique of the Indian traditions and its spiritual ethos. He was accused of echoing 'clichés uttered by ignorant and prejudiced Western critics'. 'In order to understand the strength and effectiveness of Hindu religion and philosophy one has to go back to the golden age of Hindu glory and prosperity, not to judge them by their present degraded standard'<sup>53</sup>. In reply Saha ridiculed the Hindu propensity to attribute all knowledge to the ancient *Vedas* – *Sabai vede aache* (everything is in the *Vedas*). He called Ray a 'God-drunk' person. 'My contention was that God is a subjective creation of subjective mind. People have been imagining their own images of God in every country and at every age. For lack of proof the concept of God is irrational'<sup>54</sup>. Saha was opposed to religion, not morality. This to his critic was 'like locking the stable door after the horse has bolted.

Morality is to be inspired by higher ideals. A sense of religion must be instilled in the common man if he is to be taught these qualities.' This many would have agreed to and it seems Saha was in minority. There were exceptional men of genius who began with tradition, remained in tradition and still transcended it. Ramanujan, for example, was an orthodox Brahmin, but an unorthodox mathematician. Worshipping Namagiri, Ramanujan remained all his life within his indigenous non-scientific tradition. But this regulated his personal life and behaviour, not his mathematics. As Edward Shils argues, 'a powerful mind is not bound entirely by its scientific tradition; nor is it entirely bound by the non-scientific traditions of the society in which it has grown up'<sup>55</sup>.

### Conclusion

We began with the assumption that every society, however crude or primitive it might appear from the benefit of hindsight, has certain amount of scientific rationality and endeavour within it. The South Asian society, from time immemorial, has nurtured a thinking civilization. It never lived an isolated existence and never displayed xenophobic tendencies. In pre-modern times, South Asia was known for its contribution to astronomy, medicine and mathematics. But it was during the post-Renaissance epoch (that of Descartes and Newton) that Europe began to outdistance all other culture-areas. In the 18th century this distance became virtually unbridgeable. During this period the rise of modern science itself coincided with the rise of capitalism and colonial expansion. Probably they grew in tandem, feeding each other. Once they arrived in India, sparks were bound to fly. A close contact with a vibrant, though alien, culture could not have failed to produce ripples in the minds of the local people. But sustained efforts were made to counter the growing suspicion that the introduction of Western science would lead to atheism or agnosticism. K. C. Sen, an influential Brahma leader, asked for the introduction of physical sciences on a large scale in all schools and colleges, but added that 'no attempt should be made to exalt the physical sciences at the expense of speculative philosophy... no opportunity should be missed to lead the mind of

the student from nature up to nature's God<sup>56</sup>. Mahendralal Sircar, probably the greatest proponent of scientific temper in India, also proclaimed that 'science leads to a firm belief in the Deity and a devout attitude of mind before the great First Cause'<sup>57</sup>.

Two things are striking in any account of this period. First, it was an age of translations. The numerous schoolbook societies and the scientific societies (Aligarh and Bihar, for example) were basically translation societies. Translations, no doubt, were important and must have helped popularize certain scientific notions. But were they unwarranted foreign borrowings or improper assimilations? Translated terms were continuously contested and reformulated on the basis of epistemic, linguistic and political concerns<sup>58</sup>. A major lacuna was that they were not accompanied, except in one or two cases, by any original research. They remained mere translations, secondary, superficial and of limited value. In earlier transfers of knowledge, for example from Greek to Arabic, research 'preceded' or at least accompanied translations. This was not so with 'colonial transfers', at least in the case of India. It was at best a 'trial' transfer and in this sense one could speak of the disintegration, not of the integration of knowledge<sup>59</sup>. Yet the penchant for translations must have done some good. Following Ballantyne's efforts<sup>60</sup>, Rajendralal Mitra (the most active Indian member of the Asiatic Society) prepared 'a scheme for rendering European scientific terms in the vernacular'. In the vernaculars of India 'untrammelled by any existing scientific literature', he could see the possibility 'to secure something thoroughly national and perfect'<sup>61</sup>. With limited and defective means, his intentions, however sound, were to remain utopian.

The second important aspect, of course, is the magnetic pull of tradition. In a subtle way the colonizers themselves promoted this by heaping occasional praises on 'the spirit of the East', and 'the Hindu Technology of Contemplation', etc. The Indians were shown as a superior civilization in spiritual matters. This was some, though poor, compensation for the loss of sovereignty. Indians themselves seemed to enjoy this distinction and it seems that Max Muller was discussed more than Charles Darwin. The positivists and the Brahmos emphasized the importance of reason and

observation, though their reason was not without God and was mixed with a heavy dose of moral and spiritual teaching. In any case, modern science was not seen as an alien import. Darwinism, for instance, was imported readily and the theological issues at its heart did not cause a ripple in India. The new paradigms in science were quickly accepted and numerous popular articles traced the seeds of modern advancement in ancient texts. How does one to characterize such arguments? Were they exercises in revivalism or revitalization, cultural self-defence or self-assertion? It was perhaps a combination of both, a delicate balancing act which promised a semblance of identity in an age of intellectual torpor and crisis.

P. C. Ray once approvingly quoted Paul Deussen, 'Vedanta has proved the curse of material progress in India'<sup>62</sup>. Long ago Marx had described religion as opium of the masses. In 1926, Joseph Needham (who later edited magnificent tomes on science and civilization in China) called it 'a powerful antiseptic which preserves mummified customs that have long outlasted their usefulness and otiose dogmas that have long lost their vitality'<sup>63</sup>. He quoted Pascal's famous dictum: 'Two extravagances: to exclude reason, to admit only reason'. Are they *opposuit natura*? The debate continues.

1. Andalusí wrote, 'Among all nations India was known as the mine of wisdom and the fountain-head of justice. Although their colour belongs to the first grade of blackness, yet God the Exalted has kept them immune from evil character, base conduct and low nature. He (God) has thus exalted them (Indians) over many brown and white peoples... They also obtained profound and abundant knowledge of the movements of the stars, the secrets of the celestial sphere and all other branches of mathematical sciences. Moreover, of all the peoples they are the most learned in the science of medicine and well-informed about the properties of drugs and the nature of composite elements'. Khan, M. S., *J. Pak. Hist. Soc.*, 1977, **45**, 1-31.
2. The Sufi nomenclature was *ilm Batin* (knowledge of self) and *ilm Zahir* (knowledge outside self).
3. Rather, in the eastern regions of Awadh and Bihar, the subjects bearing on *maqulat* were compulsory. Northwest India was more orthodox, and here these subjects were optional. Umar Muhammad, *Islam in Northern India during the*

*Eighteenth Century*, Munshiram Manoharlal Publishers, New Delhi, 1989, p. 272.

4. Chattopadhyay, D., *History of Science and Technology in Ancient India: The Beginnings*, South Asia Books, Calcutta, 1986, p. 10.
5. Ray, P. C., *History of Hindu Chemistry*, Williams and Norgate, London, 1909, vol. 2, p. 195.
6. Rahman (ed.), *Science and Technology in Medieval India: A Bibliography*, INSA, New Delhi, 1982, p. 494.
7. *Ibid.*, p. 333.
8. Staal, F., *Concepts of Science in Europe and Asia*, IIAS, Leiden, 1993, p. 26.
9. Habib, I., In *Technology in Ancient and Medieval India* (eds Roy, A. and Bagchi, S. K.), Sundeep Prakashan, Delhi, 1986, pp. 12-13.
10. In 1760s Rennell surveyed Bengal and later Kelly surveyed the Carnatic region. Their charts were of immense value for both military operations and revenue settlements.
11. For detailed analysis see: Headrick, D. R., *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century*, Oxford University Press, New York, 1981; Deepak Kumar, *Science and the Raj*, Oxford University Press, New Delhi, 1995; MacLeod, R. and Kumar, D. (eds), *Technology and the Raj*, Sage, New Delhi, 1995; Deepak Kumar (ed.), *Disease and Medicine in India*, Tulika Publishers, New Delhi, 2001.
12. Centenary Review of the Asiatic Society, Calcutta, 1884, p. 101.
13. Annual Report of the Asiatic Society, 1889, p. 96.
14. Panikkar, K. N., In *Situating Indian History* (eds Bhattacharya, S. and Thapar, R.), Oxford University Press, Delhi, 1986, pp. 402-432.
15. Joshi, V. C. (ed.), *Rammohan Roy and the Process of Modernisation in India*, Vikas Publications, Delhi, 1975.
16. Sen, A., Ishwarchandra Vidysagar and his elusive milestones. Occas. Pap. No. 1, CSSS, Calcutta, 1975.
17. Jambhekar, G. G. (ed.), *Memoirs and Writings of Bal Gangadhar Shastri Jambhekar*, Poona, 1950, 3 vols.
18. Raina, D., *Hist. Math.*, 1992, **19**, 371-384.
19. Raina, D. and Irfan Habib, S., *Soc. Stud. Sci.*, 1990, **20**, 455-472.
20. Wilkinson, L., *J. Asiatic Soc. Bengal*, 1834, **3**, 504-519.
21. Raina, op. cit.
22. Kidwai, S. R., *Master Ramchandra*, Delhi, 1963, p. 57.
23. Parekh, B., *Colonialism, Tradition and Reform*, Sage Publication, New Delhi, 1989, p. 61.
24. Bhattacharya, B., *Banga Sahitya Vijnan (in Bengali)*, Calcutta, 1960, p. 351.

- Bhartendu Harishchandra, an influential Hindi laureate, was also impressed by the developments in machinery and he associated them with a certain kind of attitude and behaviour; Kumar, K., *Political Agenda of Education: A Study of Colonialist and Nationalist Ideas*, Sage Publication, New Delhi, 1991, p. 151.
25. Guha, R., The Wertheim Lecture, Centre for Asian Studies, CASA Monographs, Amsterdam, 1993.
  26. Maulvi Ubaidullah, *Essay on the Possible Influence of European Learning on the Mahomedan Mind in India*, Calcutta, 1877, p. 47 (emphasis added).
  27. Kaviraj, S., In *Contesting Colonial Hegemony* (eds Engels, D. and Marks, S.), Routledge, London, 1994, pp. 19–53.
  28. Proceedings of the Annual Meeting of the Bihar Scientific Society, Gaya, 28 August 1874, MSS. Eur. F86/No. 214 R. Temple Papers IOR/BL.
  29. Syed Imdad Ali Khan (ed.), In *Akhbar-ul-Akhyar*, 15 February 1871; IOR MSS. Eur. F. 86/No. 214, Richard Temple Papers. As a recent critique argues, The concept of ilm or knowledge is being misread and misinterpreted by a large number of Islamic scholars and activists today in the same manner as the notion of jihad is being hijacked and trivialized by some Islamic extremists. Both are akin to the vandalisation of the core edifice of Islam where ilm and jihad occupied a central place; Irfan Habib, S., *Econ. Political Wkly*, 2008, **36**, 55–61.
  30. Hoodbhoy, P., *Islam and Science*, Zed Books, London, 1991, p. 68.
  31. Irfan Habib, S., op. cit.
  32. Irfan Habib, S., *Contrib. Indian Sociol.*, 2000, **34**, 63–92.
  33. Interesting argument indeed! See Ziadat, A. A., *Western Science in the Arab World*, Macmillan, London, 1986, pp. 82–89.
  34. Home Education no. 19, November 1886, Proc. vol. p. 969, NAI. Interestingly enough, astrology is being taught at several universities in India now with the approval and encouragement of politicians and even scientists.
  35. Home Public, Proc. No. 9, 13 March 1835, p. 427, NAI.
  36. Chuckerbutty, S. C. G., *Popular Lectures on the Subjects of Indian Interest*, Calcutta, 1870, pp. 79–80. He was opposed to the Revolt of 1857: 'The war which has been raging during the last 14 months is not then the war of Europeans against natives, but that of ignorance and fanaticism against knowledge and religious toleration – a war in which the educated native has as great a stake as any European in the country.'
  37. Sircar, M. L., On the desirability of a national institution for the cultivation of the sciences by the Natives of India, Calcutta, 1869, pp. 3–6.
  38. This was probably the spirit of the age. In 1882, an American Protestant missionary Edwin Lewis (from Harvard) gave a speech in Beirut on Ma'rifah al-ilm wa-al-hikmah (knowledge, science and wisdom). He distinguished between knowledge (ma'rifah) and science (ilm) on the one hand, and wisdom (hikmah) on the other. He argued 'through science man may know something about the existence of God, but he fails to apprehend who and what God is.' For 'no telescope will show us God; no microscope will show us the soul of man? Science is, therefore, limited.' (Same as Ramakrishna said in Calcutta.) Marwa S. El-shakry, *ISIS*, 2008, **99**, 701–703.
  39. Biswas, A. K., *Gleanings of the Past and the Science Movement in the Diaries of Mahendralal and Amritlal Sircar*, The Asiatic Society, Calcutta, 2000, pp. 192–203.
  40. *Ibid*, p. 230.
  41. *Complete Works of Swami Vivekananda*, R. K. Mission, Almora, 1979, vol. IV, pp. 433–434.
  42. *Ibid*, vol. I, pp. 366–382.
  43. Surjit Hans, In *History and Philosophy of Science* (ed. Virk, H. S.), GNDU Publisher, Amritsar, 1998, pp. 11–25.
  44. Maryam Jameelah, *Islam and Modernism*, Yusuf Khan Publishers, Lahore, 1977, p. 53.
  45. Speech by Maharaja Darbhanga at a public meeting at Meerut in 17 October 1911, IOR/BL MSS. Eur F 116/70 Butler Collection.
  46. This is most evident in the private papers of Harcourt Butler, the Lieutenant. Governor of United Provinces. With obvious glee he writes, 'Aga Khan is clever but a weather cock. Mahmudabad is weak as water; so is Rampur and unreliable to boot. The Nawab of Dacca hates Aligarh. The Begum (of Bhopal) spoke strongly to me against Aga Khan. His flight is generally criticized but in northern India his downfall is due to his attempt to reconcile the Hindus and the Muslims – an object as to which, it can only be said "opposuit natura".' Butler to Allen dated 6 April 1913, H. Butler papers, MSS. Eur. F 116/71, IOR/BL.
  47. Somerset, E. J. (IMS) Papers, Centre for South Asian Studies, Cambridge, 1938, pp. 33–44.
  48. Bose, J. C., *Response in the Living and the Non-Living*, Longman, London, 1902, p. IV.
  49. Ann., Sir J. C. Bose. *His Life, Discoveries and Writings*, Natesan & Co, Madras, n.d., p. 29.
  50. Ray, P. C., *Life and Experiences of a Bengali Chemist*, The Asiatic Society Edition, Calcutta, 1996, vol. I, p. 531.
  51. *Ibid*, p. 530.
  52. *Ibid*, vol. II, p. 345.
  53. Ray, A., In *Bharatbarsha*, April 1939, vol. 26, pp. 117–126.
  54. *Ibid*.
  55. Shils, Edward, *Minerva*, 1991, **40**, 1991, 391–419.
  56. Banerjee, G. C. (comp.), *K. C. Sen's Nine Letters on Educational Matters to Lord Northbrook in 1872*, Allahabad, 1936, pp. 37–42.
  57. Sircar, M. L., *Moral Influence of Physical Science*, Calcutta, 1892, p. 34.
  58. An Arabic journal in 1890s, *Al-Muqtataf*, lamented that majority of the foreign words have no synonyms (*muradif*) in Arabic, like *al-uksjin*, *al-hydrujin*, *al-klur* and *al-flur* (oxygen, hydrogen, chloride and fluoride). As a recent critique complains: now well attuned to the socio-cultural embeddedness and geopolitical situatedness of science, historians of science have paid rather less attention to language as the medium through which modern scientific ideas travel. El-shakry, M. S., op. cit.
  59. Rashed, R., In *Science and Empires* (eds Petitjean, P. et al.), Kluwer Publication, Dordrecht, 1992, pp. 76–77.
  60. Rallantyne, J. R., *A Discourse on Translation*, Mirzapur, 1855.
  61. Mitra, R., *A Scheme for Rendering of European Scientific Terms in the Vernaculars of India*, Calcutta, 1877, pp. 1–2.
  62. Ray, P. C., *Life and Experiences*, op. cit., vol. II, p. 259.
  63. Needham, J., *Science, Religion and Reality*, Sheldon Press, London, 1926, p. 349.

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