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Dayananda Saraswati and Colonial Machines: Vedic Reformation, European Science, and
Modernity in Colonial India

David Tauber

Two years ago, I set out to write a monograph on the changes wrought to Indian religious traditions by the introduction of European science during the middle period of British colonization, roughly from 1800 to 1900. In my researches I discovered a fascinating individual named Dayananda Saraswati, a religious leader who, from about 1860-1880, preached against Bhakti Hinduism, Christianity and Islam, and for a return to a utopian society founded on the Vedas in which all Indians were honored as noble members of the most civilized society ever to have existed. This society, he believed, was described in the Vedas, and included flying machines, telegraphs, and all manner of advanced technologies that although available during Dayananda's time, simply did not exist 3,000 years before.

My attempts to sort through this of science and religion was brought to a head with the discovery of a verse in his text, the *Satyartha Prakash*, in which he defends a sacrifice that involves burning incense by claiming that it is not wasteful because matter cannot be created or destroyed.¹ This seemed to correlate perfectly with the theory of the conservation of mass, a mainstay of European chemistry that was developed during the chemical revolution between 1780 and 1800.² Upon further reflection, however, I recalled a branch of Indian philosophy,

¹ Dayananda Saraswati, *The Light of Truth (The Satyartha Prakash)*, Chiranjiva Gharadwaya trans. (New Delhi: Sarvadeshik Arya Samaj Foundation, 1985) 31.

² John Hudson, *The History of Chemistry* (New York: Chapman and Hill, 1992) 72.

twin Darshanas of Vaisheshika and Nyaya, which argued a similar point almost 2000 and 1500 years before respectively.³ Searching through the accounts of his childhood education, I found a list of texts that he supposedly studied. At the top of that list was the Nayaya Sutra by Gautama, and Vaisheshika Sutra by Kanada.⁴

My initial reaction was a familiar despair that crept up each time the science/religion line became blurred, along with an uncertainty as to whether this project was even attainable. At the end of the day, I knew I had something significant, but it remained elusive. However, during a consultation with my mentor, Dr. Gupta, he pointed me in another direction entirely. Instead of parsing out what idea belong to which tradition, focus on a different question: Why did an Indian sanyasi use philosophical ideas, which had been out of vogue for centuries, to prove his point at that time? Why not, for example, argue that the performance of the homa is more valuable than the worth of the objects being consumed in the fire? This question led to a complete reconsideration of the nature of my project, and more particularly to how the history of science has thus far been written when dealing with the use of science by non-scientists, or individuals outside of the European tradition.

The history of science has been of interest to scholars since antiquity, insofar as each generation needed to understand the works of the previous generations to build their own

³ Sue Hamilton, *Indian Philosophy: A Very Short Introduction* (Oxford: Oxford University Press, 2001) 70-74.

⁴ K.C. Yadav, eds. *Autobiography of Swami Dayananda Saraswati* (New Delhi: Manohar, 1976) 16.

theories about the world around them.⁵ However, the study of the history of science for its own sake is a much more recent development. From the beginning of the twentieth century, there was an interest in the progression of knowledge that had been carried over from the nineteenth century, and this strongly showed in the way that the history of science was written. Starting in the 1940's and 1950's there is a clear sense that the history of science has developed a strong niche for itself. These books largely deal with human progress, which at this period is almost exclusively defined as the intellectual progress of western civilization, and occasionally the developments of medieval Islamic scholars.⁶

The historiography of science saw a massive shift following the publishing of the *Structure of Scientific Revolutions* by Thomas Kuhn in 1962, from a story of progress to a story of shifting paradigms.⁷ In this case, ideas were not treated as correct or incorrect, but as influential, and the research focused much more strongly on the elements that made a particular scientific idea compelling, and the factors that caused the scientific consensus to shift to a new paradigm. Most scholarship through the 1960's, and even today, falls into this

⁵ For the purposes of this paper, I will not be providing a central definition for what constitutes science. This is important, because the term is used and misused in a wide variety of contexts, and one goal of this paper is to capture the complexities of the term, what it means, and how it has been used by Europeans and Indians in understanding their role in the modern world. In brief, and for the benefit of the reader, science is typically, although not always, used throughout the paper to refer to some method or theory about the physical world that is intended to produce knowledge about it. The theories and methods that make up science are not consistent, but the one unifying feature that I have found is when the word is used it is meant to designate the knowledge described as authoritative.

⁶ C.E. Kenneth Mees, *The Path of Science* (New York: John Wiley and Sons, Inc., 1947); George Sarton, *A Guide to the History of Science: A first Guide for the Study of the History of Science with Introductory Essays on Science and Tradition* (Waltham, Mass.: Chronica Botanica Company, 1952); Marshall Clagett ed., *Critical Problems in the History of Science* (Madison: The University of Wisconsin Press, 1959)

⁷ Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962)

category of writing. Often books will include extensive sections on ideas that were previously dismissed as ignorant and are more willing to consider non-European influence on European ideas, including the notion that European developments were not the result of European genius.⁸

This turn seemingly encouraged the writing about science outside of Europe, and especially about the scientific advances in China and India. There are two common themes in the writing of the history of science in India. First, authors will focus on intellectual pursuits that look like European science, typically by describing the major Indian figures that contributed to their development. The two more popular intellectual traditions are Indian mathematics, which included advanced algebra and geometry, and Indian astronomy, which bore many similarities to European astronomy despite its traditional goal of a more complete understanding of astrology.⁹ In these cases, the authors evaluate Indian intellectual tradition in terms of a European one. Although India may have had a tradition of empirical research in Nyaya philosophy, to describe it as empirical and therefore equivalent to European empiricism removes the idea from its context and suggests something about how knowledge was organized in the Indian tradition that is not necessarily accurate.

⁸ Hudson, *History of Chemistry*, 47-60.; James E. McClellan III and Harold Dorn, *Science and Technology in World History: An Introduction* (Baltimore and London: The Johns Hopkins University Press, 1999) 198-202.

⁹ S. N. Sen and K. S. Shukla, *History of Astronomy in India* (New Delhi: India National Science Academy, 1985); Dominik Wujastyk ed., *Mathematics and Medicine in Sanskrit* (Delhi: Motilal Banaridass Publishers, 2009)

The second approach is the examination of the introduction of western science into the subcontinent. These authors largely look at the intersection of epistemology and empire, examining the introduction of cartography, field sciences such as botany and geology, and technology into the subcontinent.¹⁰ This is typically done by examining the people who entered India, such as the geologists and mechanics, or by studying the change in the availability of European education through time.¹¹

In both cases, the scholars who are studying European science outside of Europe make subtle assumptions that suggest that Europe has a proprietary ownership over intellectual traditions that originated in Europe. Although some might argue that this is true in a legalistic sense, epistemological traditions, like any other form of cultural expression, are likely to be borrowed from and morphed when groups come in contact. Although European science may have been essentially European when it developed, it could not help but be reevaluated and reinterpreted when it was imported into the subcontinent, regardless of whether the Europeans wish it to be or not.

The literature on Dayananda Saraswati's relationship to science is likewise permeated by the sense that Europeans owned science, and Dayananda was merely playing with ideas he

¹⁰ Matthew H. Edney, "The Ideologies and Practices of Mapping and Imperialism," in *Social History of Science in Colonial India*, ed. S. Irfan Habib, Dhruv Raina, and Zaheer Baber (Oxford: Oxford University Press, 2007), 26-27; S. N. Sen, "The Character or the Introduction of Western Science in India During the Eighteenth and the Nineteenth Centuries," in Habib, Raina, and Baber, 70.; Ian Inkster, Science, Technology, and Imperialism in India," in Habib, Raina, and Baber, 205-207.

¹¹ K. N. Panikkar, "Cultural Trends in Precolonial India: An Overview" in Habib, Raina, and Baber, 13-17.; S. N. Sen, "The Character of the Introduction of Western Science in India during the Eighteenth and the Nineteenth Centuries," in Habib, Raina, and Baber, 70-72.

could barely understand. The only two Western scholars of note who have dealt with Dayananda and his relationship to science are David L. Gosling and C. Mackenzie Brown. Gosling's book, "Science and the Indian Tradition: When Einstein met Tagore" offers only two paragraphs on Dayananda which do little more than introduce him as a figure of note in the history of the impact of European science on Indian tradition.¹² Brown made a more elaborate attempt to understand Dayananda's beliefs by dedicating an entire chapter to Dayananda's conception of how the world was created in an attempt to draw parallels to European creationist responses against evolution. Despite this, half-way through the chapter he switches from Dayananda to the ideas of one of his followers named Gurudatta, seemingly because Dayananda's expressed views concerning European science were not as clear, and therefore not as useful for the point Brown was attempting to prove.¹³ In both cases the authors appear to nod to Dayananda as having views relevant to the study of European science in India, but do not appear to entirely appreciate his intellectual acumen. This can be most easily seen when Gosling criticized Brown for giving Dayananda an entire chapter in his book by stating that Dayananda "has hardly any hermeneutical sense whatever." Brown agreed with his claim, merely arguing that Dayananda is important anyway.¹⁴ In both cases, the previous authors have been so focused on the proprietary European conception of science that they struggle to

¹² David L. Gosling, *Science and the Indian Tradition: When Einstein Met Tagore* (London: Routledge, 2007) 17-18.

¹³ C. Mackenzie Brown, *Hindu Perspectives on Evolution: Darwin, Dharma, and Design* (London: Routledge, 2012) 125.

¹⁴ C. Mackenzie Brown, "Conciliation, Conflict, or Complimentary: Responses to Three Voices in the Religion Science Debate," *Zygon* 47, no. 3 (September 2012)

engage with Dayananda's intellectual cooption and use of science in a way that was never intended by Europeans.

This paper is, at its heart, an attempt to reevaluate the tradition of scholarship concerning science and the Indian tradition by attempting to avoid the pitfalls that have trapped previous scholars. Instead of exploring multiple thinkers, this attempt will focus on a single religious leader, Dayananda Saraswati, and the texts that he produced to attempt to fully understand what he knew of European science during his life, how it impacted his thinking about his own religious tradition, and how he creatively employed that knowledge in ways that were not intended by the colonial powers who initially imported the knowledge. It will accomplish this by exploring his life story, including elements of his education and other life experiences that may have shaped what he knew and how he chose to employ that knowledge. Following his life story, it will go on to explore two texts, the *Satyartha Prakash* and the *Rigvedadi-bhashya-bhumika*, both of which contain numerous examples of the reformulation of European ideas into a distinctively syncretic religious tradition. In its exploration of Dayananda's ideas, this paper ultimately hopes to provide a different way of understanding the impacts that European science had on Indian religious traditions during the colonial period.

Dayananda Saraswati (1824-83), the famed nationalist, religious reformer, and Hindu missionary, is not an obvious figure to use to study the history of the impact of European science on Indian religion during the colonial period. As a religious reformer his views were inherently inconsistent with most Hindus during this period. Furthermore, his turn toward existing Indian traditions for his reformation means that, in contrast to reformers in the province of Bengal, he did not engage directly with British influences. At no point did he

attempt to make Hinduism more palatable to the British and was considered by many to be entirely uninformed about the workings of European science.¹⁵ The reasons for examining the influence that European science exerted on Indian religion through Dayananda, however, are significant. First, although Dayananda's reformer work distanced him from much of the religious life in India during this period, reformers had a strong impact on the direction religion in the subcontinent would take in the subsequent years. Dayananda is especially useful on this point because he founded a highly influential religious organization, the Arya Samaj, which played an instrumental role in the Indian independence movement.¹⁶ More importantly, however, elements of European science appear in the foundational layers of Dayananda's theology despite an almost intentional avoidance of British knowledge sources. This points to extremely significant trends in the intellectual life of Indians during this period, namely that even an individual who spoke out strongly against the British was required to engage with their ideas. In short, the apparent shortcomings of studying the impact of European science through Dayananda are in fact the greatest strength of using him as a lens.

¹⁵ John Robson, *Hinduism and its Relations to Christianity*, new ed., (Oliphant Anderson and Ferrier: Edinburgh and London, 1893) 221.; J. T. F. Jordens, *Dayananda Saraswati: His Life and Ideas* (Delhi: University of Oxford Press: 1978) 89.

¹⁶ William Gould, *Hindu Nationalism and the Language of Politics in Late Colonial India* (Cambridge, Cambridge University Press, 2004) 131-199.

An unconventional life from a conventional upbringing

Dayananda was born in 1824 to an orthodox Shaivite family of Audichya Brahmins in the state of Gujarat. Dayananda never gave his birth name, the name of his family or the name of the town he was born in, allegedly out of fear of being forced to abandon his work and return home to care for his parents.¹⁷ Later biographers have attempted to reconstruct his early life, and it is generally accepted that he was born in the town of Tankara in the princely state of Morvi in central Gujarat, and that his father was a well-off banker.

At the time of Dayananda's birth, Gujarat had been under British control for about six years. Like other regions in India, Gujarat was a composite state consisting of several autonomous regions that had been grouped together by the Mughals for administrative purposes.¹⁸ As Dayananda's state of Morvi was a princely state that was not under direct British administration, Dayananda likely had few direct interactions with the British during his childhood. From his family he gained an appreciation for traditional Hindu learning, and his early education was characterized by study of the Yajur Veda, and other Sanskrit texts. After an experience during the Shivaratri festival during which he was disturbed by a mouse crawling over the statue of Shiva, he began to question the validity of devotional practices directed toward religious icons which eventually developed into a denouncing of idol worship. Soon after the festival, the deaths of both his sister and uncle led him into a sort of depression which

¹⁷ Dayananda, *Autobiography*, 11.

¹⁸ Neera Desai, *Social Change in Gujarat: A Study of Nineteenth Century Gujarati Society* (Bombay: Vora and Co. Publishers, 1978) 2.

he coped with by throwing himself deeper into his studies.¹⁹ These deaths had another effect on the young Dayananda, which was to turn his sights toward the alleviation of suffering through the achievement of Moksha. He decided to eschew marriage to live a celibate religious life, free from distractions. Upon learning this, his parents immediately arranged a marriage for him, which he resisted by running away.²⁰

Soon after leaving his household, he found a sanyasi who was willing to initiate him into a sect of Shaivite ascetics called the Dandis, at which point he abandoned his old name and adopted the moniker of Dayananda Saraswati.²¹ This was followed by several years of wandering in the Northern States, during which time he studied the tantras and argued with local brahmins against what he deemed degeneration of Hinduism. After becoming dissatisfied with many of the Sanskrit texts, he decided to pursue further education in Sanskrit grammar from a Shaivite teacher named Vrijananda Saraswati in Mathura. He stayed for three years and was heavily influenced by Vrijananda's denunciation of the Puranas and other texts important in Bhakti Hinduism, as well as his belief in the absolute authority of those texts which Vrijananda considered to be authentically revealed from God.²² When he left Mathura, Vrijananda asked that Dayananda "Take a vow...that so long as you live you will work incessantly to spread the true knowledge of the Vedas and the Arsha-Granthas and condemn

¹⁹ Jordens, *Dayananda Saraswati*, 4-6.

²⁰ Dayananda, *Autobiography*, 17-19.

²¹ Dayananda, *Autobiography*, 21.

²² Dayananda, *Autobiography*, 43.

works which teach false doctrines and tenets..."²³. This vow drove much of his reformation work for the remainder of his life, and led Dayananda to start his reformation work soon after leaving Mathura. For the next nine years he traveled through the Northern States, interacting primarily with religious leaders, including at least one British missionary, named John Robson, whose account of his meeting with Dayananda give a good sense of his intellectual development at this time.

John Robson met and spoke with Dayananda at Ajmer 1866. In Robson's description, Dayananda is presented as intelligent and motivated, but with a very poor understanding of both the Bible and the Vedas. He still considered himself to be an orthodox Hindu but had begun to develop his ideas about the superiority of the Vedas.²⁴ Interestingly, Dayananda already argued that all science could be found in the Vedas, a view that would not appear in his writings for another ten years. Robson points out that despite Dayananda's faith in the primacy of the Vedas, he was not yet well educated in their contents, and only knew the Yajur Veda. In fact, Robson claims that he provided Dayananda with the first copies of the Rig Veda and the Bible that Dayananda ever read.²⁵ There are reasons to doubt the veracity of Robson's account, as it was published thirty-three years after the event and suggested that Dayananda read a copy of the Bible in Hindi, a language that he would not learn for at least ten more years.²⁶

²³ Dayananda, *Autobiography*, 44.

²⁴ John Robson, *Hinduism and its Relations to Christianity*, new ed., (Oliphant Anderson and Ferrier: Edinburgh and London, 1893) 218, 221.

²⁵ Robson, *Hinduism and its Relations to Christianity*, 219.

²⁶ Robson, *Hinduism and its Relations to Christianity*, 219.; Jordens, *Dayananda Saraswati*, 97.

However, it is interesting that Dayananda had already developed some ideas about European Science in the Vedas so early in life, as most of his contact with people who had been educated in British schools did not come until he traveled to Bengal.

After his foray in the Northern States, Dayananda left for Bengal in 1872.²⁷ Many biographers have downplayed the effects that this visit had on the developing swami, with Lajpat Rai dedicating a mere two pages to this visit, and Dayananda's own autobiography merely includes Calcutta as one city in a list of five that he had visited in the two preceding years.²⁸ Jordens, however, gives a more robust account and his observations are particularly important for the discussion of the impact of science on Dayananda.

To understand why Dayananda's experience in Bengal was so potent, it is important to get a brief sense of the history of Bengal and why it was so different from the rest of the subcontinent. During the eighteenth-century Bengal was a Mughal province. Although early on Bengal was under direct Mughal rule, a decline in the political power of the great Mughal in Delhi meant that by the mid-eighteen century Bengal conducted its affairs largely independently.²⁹ The British presence began in the subcontinent in the seventeenth century with the establishment of several trading posts in Madras, Bombay, and Calcutta. During these early years their influence was largely economic, as they competed with the Dutch for access to

²⁷ Jordens, *Dayananda Saraswati*, 75.

²⁸ Lala Lajpat Rai, *A History of the Arya Samaj: An Account of its Origins, Doctrines and Activities, with a Biographical Sketch of the Founder*, Sri Ram Sharma, ed. (Bombay: Orient Longmans, 1967) 38-39.; Dayananda Saraswati, *Autobiography*, 51.

²⁹ Hermann Kulke and Dietmar Rothermund, *A History of India* (London: Routledge, 2016) 177.

trade goods.³⁰ In 1757 the East India Company overthrew the government with the help of the Diwani's military commander because of trade restrictions placed on the British East India Company by the Diwani of Bengal. The Great Mughal, seeing an opportunity to increase his political clout, blessed the change in leadership under the impression that the British may be more loyal to him than the previous rogue Diwani.³¹ The great Mughal's political maneuvering backfired, however, and Bengal served as the base of operations for later military campaigns that led to the company's complete political control of the subcontinent by about 1800.³² This culminated in the sepoy mutiny of 1857 after which the company was deemed incompetent to run an empire and dissolved, and Queen Victoria was crowned Empress of India.³³

Politically, then, Bengal had been in the British sphere of influence for over one hundred years before Dayananda's visit in 1872. Socially, the impact was far more significant. In the second half of the eighteenth century elite culture in Bengal was a hodge-podge of classic Sanskrit, Mughal, and local folk traditions.³⁴ When the British crown renewed the East India Company's charter in 1813, they required the company to set aside one lakh of rupees to promote the education of Indians in their territory.³⁵ Originally this money went to funding

³⁰ Kulke and Rothermund, *A History of India*, 151.

³¹ Kulke and Rothermund, *A History of India*, 183.

³² Kulke and Rothermund, *A History of India*, 190-91.

³³ Kulke and Rothermund, *A History of India*, 211, 219.

³⁴ Sumanta Banerjee, *The Parlor and the Streets: Elite and Popular Culture in Nineteenth Century Calcutta*, (Calcutta: Seagull Books, 1989) 147.

³⁵ One lakh is 100,000. Due to poor economic records, it has not been possible to determine a modern correlate for this amount.

Sanskrit and Arabic schools, but by the 1830's there were many in the company who thought that money could be better spent educating the Indian populous in English language and culture.³⁶ This is best exemplified in McCaulay's Minute on Education, an open letter written by Thomas Babington McCaulay in 1833, which advocated for spending education money on English schools to cultivate "a class of persons Indian in blood and colour, but English in tastes, in opinions, in morals and in intellect," the reason being that the British could "leave it to refine the vernacular dialects of the country, to enrich those dialects with terms of science borrowed from the Western nomenclature, and to render them by degrees fit vehicles for conveying knowledge to the great mass of the population."³⁷ Although McCaulay's plan was debated, the suggestion was ultimately adopted, and English schools began to churn out graduates at an increased rate. This ground shift in education was matched by an influx of Christian missionaries during the middle years of the nineteenth century. The company had a variety of restrictions on missionary work in the subcontinent which were not removed until 1833, only two years before Thomas McCaulay published his minute for the reformation of education.³⁸ This resulted in a heated debate at the beginning of the nineteenth century about the nature of religion and statehood, with a Christian missionary Claudius Buchanan claiming that

³⁶ Anne Sliwka, *Transplanting Liberal Education: The Foundation and Development of Liberal Arts Colleges in Western India* (Frankfurt Am Main: Peter Lang, 2004) 75.

³⁷ "Minute by the Hon'ble T. B. Macaulay, dated the 2nd February 1835," Columbia University, accessed November 4, 2017, http://www.columbia.edu/itc/mealac/pritchett/00generallinks/macaulay/txt_minute_education_1835.html

³⁸ Ian Barrow, *The East India Company, 1600-1858: A Short History With Documents* (Indianapolis: Hackett Publishing Company, 2017) 99.

proselytization was necessary for the establishment of an empire, stating “There is no natural bond of union between us and them...Nothing in law, language or religion, in interest, color, or country...We can approach them in no other way than by the means of our religion.”³⁹ Again, as in education, such ideas were challenged, and an unnamed member of the East India Company published a rebuttal three years later in an attempt to defend both native Indians and the company’s decision to put restrictions on missionary work.⁴⁰ However, like the efforts against Thomas McCaulay, these failed and the number of missionaries in the subcontinent began to steadily increase.⁴¹ As a result of the educational and proselytization efforts of the British, the culture of upper class Bengalis began to shift, blending English and Bengali, adopting English customs, and attempting to do away with the eclecticism that characterized the earlier elite society of Bengal.⁴² By the time of Dayananda’s visit, this class, called the Bhadrlok, made up a sizable portion of Bengali high society. It was members of the Bhadrlok who invited Dayananda to Calcutta, and who greeted him warmly on his arrival.

Dayananda’s arrival in Calcutta was met with great interest by members of the Brahmo Samaj, a religious reformation group founded by Ramohan Roy and popular among the

³⁹ Claudius Buchanan, *Memoir of the Expediency of an Ecclesiastical Establishment for British India; Both as the Means of Perpetuating the Christian Religion among Our Own Countrymen; and as a Foundation for the Ultimate Civilization of the Natives* (London: T. Cadell and W. Davies, 1805), 12-13, 30-32, 39. As edited in Ian Barrows, *The East India Company: 1600-1858* (Indianapolis: Hackett Publishing Company, 2017) 151-153.

⁴⁰ Barrow, *The East India Company*, 153-55.

⁴¹ Barrow, *The East India Company*, 105-106.

⁴² Sumanta Banerjee, *The Parlor and the Streets*, 152.

Bhadralok. Dayananda had an equivalent interest in the life and ideas present in Bengal. In the first seven weeks of his arrival we know that he gave no public speeches or engaged in any public debates, but we do know of at least thirty different religious reformers, nationalists, and Hindu pandits who sought an audience with him.⁴³ From this we get the impression that his first order of business in Bengal was to develop a full sense of the religious and cultural life of this unique region. These meetings went largely unrecorded, but there are several points that show us how this period influenced him. First, he became close to a well-known religious reformer named Keshub Chandra Sen. Sen was educated in the British school system and had been particularly active as a religious reformer in the Brahmo Samaj. His interest in creating a syncretic blend of Hinduism and Christianity would ultimately lead to a split in the Brahmo Samaj.⁴⁴ Sen advised Dayananda to appeal to the lower classes by wearing clothing instead of a simple loin cloth, in addition to learning Hindi. Dayananda accepted both pieces of advice.⁴⁵ Dayananda would also become close to Debendranath Tagore, another leader of the Brahmo Samaj. Tagore was also educated in the British school system, at Hindu College, but unlike Sen chose to look within the Indian tradition for reformation of Hinduism.⁴⁶ He was particularly fond of the Upanishads, and wrote the Brahmo Samaj's key text, the Brahmo Dharma, in the

⁴³ J. T. F. Jordens, *Dayananda Saraswati*, 76-77.

⁴⁴ The Editors of Encyclopedia Britannica, "Keshab Chunder Sen," *Encyclopedia Britannica*, accessed December 1, 2017, <https://www.britannica.com/biography/Keshab-Chunder-Sen>.

⁴⁵ Jordens, *Dayananda Saraswati*, 82.

⁴⁶ Debendranath Tagore, *The Autobiography of Maharshi Devendranath Tagore*, trans. Satyendranath Tagore and Indria Devi (London: Macmillan and Co. 1914) 59-60.

style of the Upanishads.⁴⁷ Sen and Tagore, along with others among the Bengali literati, also showed Dayananda the value of using print publishing to facilitate the distribution of his teachings, and soon after his visit to Bengal he would become a prolific writer.⁴⁸ His first work, the *Satyartha Prakash*, was published shortly after his visit to Bengal and included many of the same citations from the Upanishads as Tagore's *Brahmo Dharma*, suggesting intellectual cross-seeding.⁴⁹

Dayananda's time in Bengal also influenced his ideas of religious reformation. It was during this period that he was concretely introduced to the value of creating religious organization by the works of the Brahmo Samaj, a success he would later try to emulate with the creation of his own Arya Samaj.⁵⁰ He was also introduced, through the work of the Brahmos, to Hinduism in an international context. Prior to Bengal he largely thought of reformation as it related to Hindu bhakti traditions, but the efforts of the Brahmos to subvert the efforts of missionaries using Hindu schools turned his attention strongly toward Hinduism in relation to Christianity and Islam, forcing him to think of the role of Hinduism on the world stage. Education, Hinduism in relation to other religions, and the place of Hinduism in world history would all later appear prominently in his *Satyartha Prakash*.

⁴⁷ Debendranath Tagore, *Brahmo Dharma*, trans. Hemchandra Sarkar (Calcutta: Sadharan Brahmo Samaj, 1992) ii.

⁴⁸ Jordens, *Dayananda Saraswati*, 86-87.

⁴⁹ Jordens, *Dayananda Saraswati*, 79.

⁵⁰ Jordens, *Dayananda Saraswati*, 127.

Following the successful publishing of the *Satyartha Prakash*, Dayananda decided to return to his homeland. He had been invited to Bombay several years earlier by two members of a Bombay merchant caste associated with Karsondas Mulji. Mulji was a famous reformer whose criticisms of the Vallanacharya sect landed him in a widely reported libel case with a local Raja. Mulji had also used the Vedas to argue against sectarianism, so Dayananda had a ready audience who already approved of his arguments and wanted to learn more. In Bombay, Dayananda found an interested audience not only among the followers of Mulji, but also among members of a reformer organization called the Prarthana Samaj, which had been founded by Keshub Chandra Sen during his visit to Bombay, and which shared many of the ideas Dayananda encountered in Bengal.⁵¹ Although Dayananda's primary concern was to form the Aryavarta, or organization of all Indians, local interests petitioned Dayananda to consent to the founding of more regional associations.⁵² After some false starts earlier in the year due to opposition to Dayananda and his teachings, the first chapter of the Arya Samaj was founded in April of 1875.⁵³ As for Dayananda himself, his autobiography merely states that he visited Bombay, established a chapter of the Arya Samaj there, and gave several lectures in the surrounding towns.⁵⁴ Although Dayananda does not appear to assign much significance to this time period, it is clear from the writings that he produced during and afterward that it had a

⁵¹ Jordens, *Dayananda Saraswati*, 128-30.

⁵² Jordens, *Dayananda Saraswati*, 132.

⁵³ Jordens, *Dayananda Saraswati*, 134.

⁵⁴ Dayananda, *Autobiography*, 51-52.

profound effect on how he conceived of his role as a reformer. The founding of the Samaj crystallized several of Dayananda's ideas about the needs of his Aryavarta which was becoming a reality through the foundation of the Arya Samaj, and part of his time in Bombay was dedicated to writing the *Aryabhivinaya*, a text which detailed rituals and prayers for the members of the Arya Samaj. Dayananda published the *Aryabhivinaya* in 1876.⁵⁵

He spent most of the next year in Benares, traveling according to his custom to other nearby cities for varying amounts of time, and focused primarily on writing the *Rigvedadi-Bhashya-Bhumika*, or the introduction to the commentaries on the Vedas.⁵⁶ Little information is available on his working conditions during this time. He traveled frequently but spent no time in the public sphere. He was effectively isolated during this period, so the ideas expressed in the *Bhumika* were probably developed from experiences and information he gained in his previous travels including Bombay and Calcutta. The *Bhumika* was published in 1877, at which point Dayananda left the Northern States.⁵⁷

The last seven years of Dayananda's life were highly significant for the development of the Arya Samaj, and for his biographers. However, as his theology had already been solidified by this period, and the texts that show his engagement with European science had already been written, this period is not relevant to the present study. In brief, he spent two years in the

⁵⁵ Jordens, *Dayananda Saraswati*, 153.

⁵⁶ Jordens, *Dayananda Saraswati*, 155.

⁵⁷ Jordens, *Dayananda Saraswati*, 157, 160.

Punjab, where he had considerable success in setting up ten chapters of the Arya Samaj.⁵⁸ He then turned his attention to further developing the Arya Samaj and publishing more texts, spending the last five years of his life moving between the Northern States and Rajputana.⁵⁹ Dayananda passed away in 1884 at the age of 59 at Ajmer, after a sudden onset of illness at the court of the Maharaj of Jodhpur.⁶⁰ His death interrupted several works in progress, most notably the second edition of the *Satyartha Prakash*. It is significant that he never saw the second edition of his most famous work published, as it is the only edition currently available to scholars and members of the Arya Samaj. However, he had approved the publication proofs prior to his death, which suggests that he did not intend to make considerable revisions.⁶¹

The *Satyartha Prakash* (The Light of Truth)

Although Dayananda wrote prolifically over his lifetime, the *Satyartha Prakash* is his most well known and most easily accessible work. It was essentially a compilation of his lectures and contains his views on a wide variety of subjects, most notably theology, education, government, and other religious traditions. It is considered by the modern Arya Samaj to be his

⁵⁸ Jordens, *Dayananda Saraswati*, 180-181.

⁵⁹ Jordens, *Dayananda Saraswati*, 184.

⁶⁰ Rai, *A History of the Arya Samaj*, 44-45.; Ganga Ram Garg, *World Perspectives on Dayananda Saraswati* (New Delhi: Concert Publishing Company, 1984) 97.

⁶¹ Jordens, *Dayananda Saraswati*, 99.

Magnum Opus.⁶² Dayananda originally dictated the lectures to a translator who wrote them in Hindi; At the time of writing he only knew Gujarati and Sanskrit.⁶³ Although it was published initially in 1875, the first edition is only held in a few archives and private collections, and the second edition, published in 1884 shortly after Dayananda's death, is the only edition currently available.⁶⁴ There is only one scholar who has gained access to the first edition, and his comparison revealed that Dayananda's thought clearly evolved on the topic of the Vedas and Vedanta during the last eight years of his life.⁶⁵

The second edition is organized into 14 chapters, with the first 10 representing Dayananda's views on diverse subject matter such as education (Chapter 2), marriage (chapter 4), the creation of the universe (Chapter 8), and appropriate conduct, including dietary restrictions (Chapter 10). The final four chapters are a criticism intending to disprove the truth of various religions that Dayananda had studied including Indian bhakti traditions, Buddhism, Jainism, Christianity, and Islam.⁶⁶

The book does not treat the topic of science per se, however there are numerous examples throughout the text that show a strongly developed sense of the significance of both

⁶² Dayananda Saraswati, *The Light of Truth (Satyarth Prakash)*, Chiranjiva Gharadwaya trans. (New Delhi: Sarvadeshik Arya Samaj Foundation, 1985) 2. Available at http://www.aryasamajamagar.org/download/satyarth_prakash_eng.pdf.

⁶³ Jordens, *Dayananda Saraswati*, 97.

⁶⁴ J. T. F. Jordens, *Dayananda Saraswati*, 99.

⁶⁵ J. T. F. Jorden, "Dayananda Saraswati and Vedanta: A Comparison of the First and Second Editions of His Satyarth Prakash," *The Indian Economic and Social History Review* (1972), 367.

⁶⁶ Dayananda Saraswati, *Satyartha Prakash*, 3.

Indian and European science. A survey of the English translation of the text shows that the word science appears 131 times. This may be misleading, as Dayananda never used the English word science. The common Hindi translation for science, *vijnana*, which came into use around this time to translate the European notion of science, likewise does not appear. Instead, he appears to have relied primarily on the word *Vidya*, whose use dates to the Upanishads and which can refer to a sort of fundamental knowledge about the world or about spiritual reality.⁶⁷ Because Dayananda uses the word *Vidya* indiscriminately to refer to elements that are clearly part of the Indian tradition and elements that are clearly part of the European tradition, it would appear that he is making no distinction between the traditions. Although this might be true superficially, the specific contexts that the word appears in suggests that he is embedding European ideas in his theology.

Science appears in two distinctive ways throughout the *Satyartha Prakash*. First, he uses science to authoritatively disprove what he considers to be superstitions and wrong beliefs from the various traditions that he criticizes, including Indian superstitions, astrology, Christianity, Islam and Jainism. Second, he uses knowledge of science as a mark of a religious and secular teacher, equating greater scientific knowledge with teachers of greater renown.

To authoritatively disprove beliefs which he finds distasteful, Dayananda relies quite heavily on astronomy, geology, geography, and most especially reason from the senses. However, it appears that he uses ideas from both the Indian and European traditions to make

⁶⁷Gavin Flood, "Knowledge/Wisdom (Jñāna/Vidyā)" *Brill encyclopedia of Hinduism*, accessed march 8, 2018, http://referenceworks.brillonline.com/dist.lib.usu.edu/entries/brill-s-encyclopedia-of-hinduism/wisdom-and-knowledge-jnanavidya-COM_2050140?s.num=0

his point. To an argument that the Homa sacrifice is wasteful because it involves burning substances that could be put to better use, Dayananda says

“That only shows your ignorance of Physical Science, for it is one of its cardinal principles that nothing is really lost in this world. You must have noticed that, even when you are standing at some distance from the place where Homa is performed, you can smell a sweet fragrant odour in the air. That alone proves that an odoriferous substance put into the fire is not destroyed, but, on the other hand, being rarefied, fills the room, and is carried by the air to distant places where it rids the air of its foulness.”⁶⁸

The reference to physical science in general terms is typical for Dayananda’s pattern of response, but his use of conservation of matter to argue on behalf of the Homa sacrifice creates a slight problem for attempts to understand his blending of European science and Indian Religion. In the European tradition, the theory of conservation of mass dates back to the 18th century, when advances in measurement tools allowed chemists to determine that chemical processes such as burning released gas in proportion to the loss of matter of the object that was burnt. This was one element of the larger chemical revolution, which had established itself theoretically by the mid-nineteenth century when Dayananda was writing.⁶⁹ However, one of the six traditional philosophies in the Indian intellectual tradition, Nyaya, held a view very similar to the conservation of mass. In fine, the universe was comprised of nine elements, including earth, fire, water, air and ether, all of which are comprised of indestructible atoms.⁷⁰

⁶⁸ Dayananda, *Satyartha Prakash*, 31.

⁶⁹ Hudson, *History of Chemistry*, 72.

⁷⁰ Sue Hamilton, *Indian Philosophy: A Very Short Introduction* (Oxford: Oxford University Press, 2001) 72-74.

An Indian source for Dayananda's statement is more likely, as his autobiography states that he had studied two foundational texts of Nyaya school during his upbringing in Gujarat, the Nyaya Sutra by Gautama and the Vaisheshika Sutra by Kanada.⁷¹ Furthermore, in a later section of the *Satyartha Prakash*, Dayananda criticizes the Jains for their belief in the beginninglessness and endlessness of the world by using language that seems highly influenced by Nyaya philosophy.⁷²

Other quotations from the *Satyartha Prakash* suggest a more direct engagement with European science. At the end of the book, Dayananda includes a fifty-one part statement of his beliefs, itself likely inspired by the statements of beliefs carried by the Protestant missionaries he had encountered. Number twenty-eight reads

I hold that the performance of yajna (sacrifice) is most commendable. It consists in showing due respect to the wise, and the learned, in the proper application of the principles of chemistry and physical and mechanical sciences to the affairs of life, in the dissemination of knowledge and culture, in the performance of Agnihotra which, by contributing to the purification of air and water, rain and vegetables, directly promotes the well-being of all sentient creatures.⁷³

It is clear here that Dayananda has some form of experience with European scientific developments, as he is directly commenting on chemistry and mechanics. His threefold division of chemistry, physical science and mechanical science is also suggestive, as other historians have noted these three areas, in addition to medicine, were considered to be the most highly

⁷¹Dayananda, *Autobiography*, 16.

⁷² Dayananda, *Satyartha Prakash*, 351.

⁷³ Dayananda, *Satyartha Prakash*, 31

valued branches of science in early nineteenth century England.⁷⁴ Unfortunately, the complexity of the language barrier prevents a deeper exploration of how he described chemistry and mechanical sciences in nineteenth century Hindi.

The second way that Dayananda makes use of science in the *Satyartha Prakash* is as a marker of an authoritative religious teacher. Dayananda had shown concern for distinguishing an authoritative teacher from a fraud from his time in Tehri, and a concern for authority is not surprising to find in the *Satyartha Prakash*.⁷⁵ However, the consistent use of scientific references to establish that authority suggests something of a complex relationship with both traditional Indian beliefs and new European ideology.

In one section of the *Satyartha Prakash*, Dayananda explains how to recognize the presence of the three gunas; Sattva, Rajas and Tamas.⁷⁶ The three gunas are considered to permeate the world, and are ordered into a hierarchy of desirableness, with sattva representing goodness, religious attainment and knowledge; rajas representing vigor, passion and agitation; and tamas representing lethargy and darkness.⁷⁷ He describes the traits of a man who is influenced by the low, median, and high degrees of each Guna. Suggestively, elements of European learning are found in all three degrees of Sattva, as is shown in the following quote.

⁷⁴ Ian Inkster, "Science and Society in the Metropolis: A Preliminary Examination of the Social and Institutional Context of the Askesian Society of London, 1796-1807," *Annals of Science*, vol. 34 (1977) 31.

⁷⁵ Dayananda, *Autobiography*, 28.

⁷⁶ Dayananda, *Satyartha Prakash*, 196-199.

⁷⁷ Angelika Malinar, "Guna" *Brill Encyclopedia of Hinduism*, accessed June 14, 2018, http://referenceworks.brillonline.com/dist.lib.usu.edu/entries/brill-s-encyclopedia-of-hinduism/guna-COM_000191?s.num=5

“Sanyaasis, teachers of the Veda, aeronauts, astronomers, physicians or hygienist, i.e., those who devote themselves to the science and art of the perfect development of the human body, proceed from the Sattva of the lowest degree.”

As well as,

"Masters of all four Vedas, masters of all the sciences and arts, who invent (or construct) air ships and such machines, those who are embodiments of righteousness and wisdom, those who acquire control over the elementary result [sic] from the Sattva of the highest degree."⁷⁸

Although there is a tradition of aircraft in Indian literature, there is not a precedent to organize professions such as aeronaut and hygienist together as Dayananda does in the first verse. In Sanskrit literature, flying vehicles are called Vimanas, and are commonly found in religious myths, such as the Ramayana.⁷⁹ Prior to the introduction of machines by European traders, most manufacturing in India was done by hand, and often by members of lower castes. There is little reason to associate manufacturing with religious attainment prior to the change of values associated with British Colonialism.

This, along with the mere fact that Dayananda places together two professions which did not traditionally exist in India, show that Dayananda’s arguments in the *Satyartha Prakash* engaged with European cultural ideas and values. Their placement and use show that he is embedding European ideas and values into his theology. As will be discussed in the following section on the *Rigvedadi-Bhashya-Bhumika*, this was likely done to invest his reformation work with the authority of modern science.

⁷⁸ Dayananda, *Satyartha Prakash*, 198.

⁷⁹ Linda Egenes and Kumuda Reddy, *The Ramayana: A New Retelling of Valmiki’s Ancient Epic-Complete and Comprehensive* (New York: Tarcherperigee, 2016) 158.

The *Rigvedadi-Bhashya-Bhumika* (Introduction to the Commentary on the Vedas)

The *Rigvedadi-Bhashya-Bhumika* (abbreviated *Rigvedadi*) was a significant literary achievement for Dayananda. Published in 1877, it was originally written in Sanskrit and later translated into Hindi. It aimed to prove that the Vedas included all manner of secular and sacred knowledge by organizing Vedic verses by topic and including explanatory commentaries to show how they embody the various principles.⁸⁰ The book includes such topics as mathematics, medicine, rebirth, the origin of the Vedas, marriage, and appropriate behaviors for life cycles.

Science in the *Rigvedadi* takes several forms and is used slightly differently than in the *Satyartha Prakash*. As Dayananda comments on his perception of the true meaning of the Vedic texts, he does not describe contemporary Indian society, but rather the state of knowledge when the Vedas were composed, roughly 2,000 B.C.E. This makes the inclusion of European ideas highly suggestive of his underlying patterns of thought. The sections of most interest are his commentary on how to build land, sea, and air vehicles; the creation of telegraphs; and astronomy, which includes a section on the theory of gravity.⁸¹ He also has two sections that

⁸⁰ Jordens, *Dayananda Saraswati*, 157.

⁸¹ Swami Dayananda Saraswati, *Introduction to the Commentary on the Vedas*, trans. Ghasi Ram (Delhi: Sarvadeshik Arya Pratinidhi Sabha, 1958)

consider medical science and mathematics which follow a much more traditionally Indian line, but which can be used to juxtapose the unorthodoxy found in the other sections.

In chapter twelve, Dayananda provides a translation and interpretation of the Rig Veda that suggests that the sun is the center of the solar system, and that the planets are bound together with gravity.⁸² These follow strongly the European tradition of astronomy, where heliocentrism and gravity had been established by Copernicus and Newton in the sixteenth century and seventeenth centuries, respectively.

These claims are surprising in the context of the Vedas because although ancient India is famous for its well-developed mathematical astronomy, it took a considerably different form from European astronomy until the colonial period. The astronomy that is present in the Vedas uses the stars and the stages of the moon to establish the lengths of the solar year and the lunar month at 360 and twenty-seven or twenty-eight, respectively. The Vedas further provided descriptions of five planets and the early constellations that would later be significant for mathematical astronomy.⁸³ Later astronomy developed a strongly mathematical bent, possibly imported from Greece.⁸⁴ Some suggestions about the laws of gravity were introduced by

⁸² Dayananda, *Introduction to the Commentary on the Vedas*, 121-126.

⁸³ Sukumar Rajan Das, "Scope and Development of Indian Astronomy" *Osiris* 2, no. 7 (1937) 207.; David Pingree, "The Mesopotamian Origins of Early Indian Mathematical Astronomy" *Journal for the History of Astronomy* 4, no. 9 (February 1973) 1.

⁸⁴ Dennis Duke, "The Equant in India: The Mathematical Basis of Ancient Indian Planetary Models" *Archive for History of Exact Sciences* 59, no. 6 (October 2005) 566-567.

Bhaskara II in 1150 in his *Shiddhanta Siromani*. However, these ideas don't appear to have gained traction within the larger tradition.⁸⁵

Similarly, the geocentric model was so entrenched within the Indian tradition of astronomy that even Jai Singh, the famed king of Jaipur in the early eighteenth century who patronized Indian astronomical observatories and worked to integrate European astronomical ideas into Indian astronomy, continued to use the geocentric model even after learning of the heliocentric model from Johan Rapist Hoemann's *Larger Atlas of the Whole World (Grosser Atlas Uber Die Gazne Welt)* in 1730.⁸⁶ Given all this, any suggestion that the heliocentric model and the theory of gravity enjoyed any antiquity in India, as Dayananda does in the *Rigvedadi*, does not reflect the realities of the Indian tradition. Instead, it looks as if Dayananda is attempted to insert European ideas into the Vedas by passing the ideas off as authentically Indian.

The case is similar for the machines that he describes elsewhere in the *Rigvedadi*, and most particularly with telegraph.⁸⁷ The telegraph was initially developed in the mid-eighteenth century during experiments with electricity and magnetism.⁸⁸ Due to the pre-existing semaphore system, electric telegraphy did not gain widespread use in England until the 1840's,

⁸⁵ S. N. Sen and K.S. Shukla, eds., *History of Astronomy in India* (New Delhi: Indian National Science Academy, 1985) 141.

⁸⁶ Sen and Shukla, *History of Astronomy in India*, 368.

⁸⁷ Dayananda, *Introduction to The Commentary on the Vedas*, 175-6.

⁸⁸ Russel Burns, *Communications: An International History of the Formative Years* (London: The Institution of Electrical Engineers, 2004) 66.

only thirty years before Dayananda wrote the *Rigvedadi*.⁸⁹ Between 1851 and 1862, the length of telegraph line laid in England increased ten-fold, and the number of messages sent increase from about 48,000 to over 2,500,000.⁹⁰ In that time, its significant in India likewise increased as the English imported it to help run their colony. Clearly the telegraph was not present prior to the colonial period, as it was not even present in India at Dayananda's birth. Its presence in the *Rigvedadi* is suggestive of the significant and ubiquitous role that it played in mid- to late-eighteenth century in India.

With these anachronisms, it seems that Dayananda was accomplishing two ends at once. First, he was anachronistically projecting contemporary ideas backward in time to understand them in terms of the Indian tradition. Second, he was reforming the tradition in response to the new information that he found in his experience with European science. It would appear that he was simultaneously reestablishing the authority of the Vedas by coopting a new and authoritative way of knowing, while also recreating the tradition in a form that allowed both himself and other Indians who had been influenced by British epistemology to feel comfortable with this Indian tradition.

⁸⁹ Burns, *Communications*, 78-79.

⁹⁰ Burns, *Communications*, 112.

Conclusion

Looking over the references that Dayananda makes in the *Satyartha Prakash* and the *Rigvedadibhashyabhumika*, it is clear that he was deeply immersed in an environment that valued European science, even if he claimed that he was reforming Hindu religious life to be more in line with traditional sources. It is simply impossible that a traditionally educated sanyasi and brahmin from Gujarat would have knowledge of ideas such as the theory that gravity is the force that holds planets in their orbits, let alone to argue that such an idea was present in the earliest religious texts of India, unless he were in an environment that rewarded references to science, however poorly understood those references might be. Through this paper I have attempted to point to certain times in his life when he would have had access to this discourse, and suggested why engaging with this discourse may have been appealing to him. However, the value of this discourse to dayananda may be worth restating, using slightly different evidence.

A final example of the importance of science in legitimizing Dayananda's nascent reform movements can be found in a section in the *Satyartha Prakash* entitled "The Advanced Lifestyles of the Europeans." In this section, he suggests that the Europeans are advanced not because of their habits in dress or eating, but because they educate their children, sacrifice for their nation, and believe in their own superiority, and live industrious lives.⁹¹ At the end of this section he states "...it is a sin to do others harm while it is meritorious to promote public good. Hence it behooves an enlightened man to...act in such a manner as would help him as well as others to make some progress."⁹² In short, it seems that Dayananda was impressed by the

⁹¹ Dayananda, *Satyathra Prakash*, 307

⁹² Dayananda, *Satyartha Prakash*, 308.

European solidarity produced by the dual forces of modernization and nationalism and wished for the same benefits in India. This is one additional way that European ideas may have influenced Dayananda's work.

There are two directions this research could be taken in the future. First, research could explore the relationship between nationalism, modernity, and science in Dayananda's works to better understand how these forces worked together to produce such a unique mind. There are numerous gaps in this paper, including a deeper look at the intersection of science and his striving against Christian missionaries, his development of the Arya Samaj, and his nationalist rhetoric. A gap which was felt dearly while writing this paper was Dayananda's reinterpretation of deity names in the Vedas, which allowed for some of his more creative interpretations and is a hallmark of his hermeneutic style. Later research might focus on how his unique melding of modern technology and ancient intellectual traditions was supported by this hermeneutic innovation, in addition to the intersection of science and his many other activities.

The second direction for further research deeply undercuts the premise of this paper, and as such deserves special note. Although this paper covered the references to European science in Dayananda's writings in more depth than previous studies, it suffered from the language barrier. My only languages are English and a small amount of Sanskrit, while Dayananda's texts are largely written in Hindi. There are no current critical translations of any of Dayananda's works and the available translations are largely done by members of the Arya Samaj. Although the translations done by members of the Samaj may be useful for religious practice, they are not sufficient to serve as primary sources for historical inquiry.

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