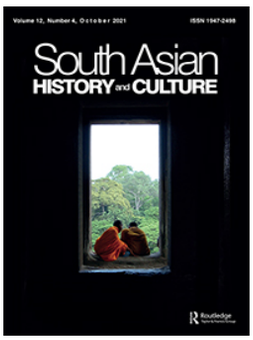

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Science in the vernacular? Translation, terminology and lexicography in the *Hindi Scientific Glossary* (1906)

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ABSTRACT

Vernacular languages have served as media of science education in colonial and postcolonial South Asia, but how was modern scientific knowledge translated into these languages and made available for non-English reading publics? This article draws attention to the overlooked genre of the glossary of technical terminology, conceived as the source list of the very words needed for vernacular scientific discourse. Focusing on the Nagari Pracharini Sabha's *Hindi Scientific Glossary* (*HSG*, 1906), I analyse the linguistic, epistemic and political strategies by which technical terms and chemical nomenclature were rendered meaningful and authoritative for the Hindi science learner. The making of the *HSG* exemplifies the tensions of crafting authoritative equivalences faced by Indian language activists in a colonial episteme. Situating the glossary in its colonial genealogy and within a multilingual imaginary of science translation and language activism, this article demonstrates the inter-vernacular resonance and quest for lexicographic authority in Indian projects of terminology.

Keywords
translation; chemical nomenclature; multilingualism; Rajendralal Mitra; scientific publics; Nagari Pracharini Sabha

Introduction

In 1906, the Nagari Pracharini Sabha of Benares published the *Hindi Scientific Glossary* (hereafter *HSG*). The Sabha is better known to scholars of language, religion and nationalism in South Asia as a literary society which led the divisive cause of Hindi nationalism, rather than for any engagement with matters of science. At the turn of the twentieth century, the society led a fateful campaign for the use of Hindi and Nagari script, displacing the perceived hegemony of Urdu in the law courts of north India. It initiated two long-running periodicals, produced a landmark dictionary, deliberated on Hindi grammar and literary style, and even sent its members to other cities in search of old Sanskrit and Hindi manuscripts.[1] In contrast with these well-known dimensions of the Sabha's strident language activism, this article focuses on the bilingual scientific glossary, a source which has been overlooked equally by scholars of Hindi nationalism and historians of science. Situated at the cusp of histories of language, literature and science, the *HSG* is as much an artefact of the global circulations of modern scientific knowledge, as a testament of the scientific strivings of South Asian linguistic nationalisms.

The nineteenth century globalization of the western sciences that accompanied the expansion of European empires presented their technical vocabularies as a challenge in several locales including British India. Historians of science working on other non-western contexts have convincingly demonstrated that there is no 'culturally neutral scientific *lingua franca*.'[2] The seeming translatability of scientific discourse is concretely grounded in local sociocultural, epistemological and

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linguistic regimes. Science in translation, once relocated in new historical contexts, acquires meaning through its tactical deployment by local actors in relevant political agendas.[3] In the early nineteenth century, European officials and philologists had translated "western" scientific knowledge into South Asian languages as part of educational schemes for civilizing colonial subjects. By the end of the century, Indian elites instead took the lead and began to forge terminologies to promote modern science in their languages. The Sabha took great pride in the fact that it had produced a glossary of technical terms conceived and executed entirely through Indian initiative at a time when few Indians had access to scientific training, and fewer still could aspire to scientific careers. The *HSG* provided Hindi equivalents for English technical terms used in scientific discourse.[4]Technical vocabularies of various disciplines had been introduced at colonial-modern universities and colleges in the mid-nineteenth century, and their translation into Hindi and other South Asian languages relocated them amongst the subcontinent's existing knowledge communities and emerging readerships. The translators, compilers and editors who volunteered their labour to make the Sabha's glossary of technical terms included Sanskrit scholars, Hindi writers, university graduates and college teachers. At the same time, many of them were also key actors in Hindi's ongoing linguistic reform and literary transformation as a modern 'mother tongue.' This article bridges the often-discrete historiographies of language, literature and science to analyse the making of the glossary in the Sabha's programme of remaking Hindi as a language of literary, legal, political as well as scientific discourse.

Philology and lexicography played a leading role in reordering the languages and knowledges of precolonial South Asia into the hierarchies of the colonial episteme. Dictionaries, glossaries and language grammars produced as imperial instruments for learning South Asian languages also became sites for their philological comparison with European languages in the late eighteenth century.[5] The incapacity of these languages to serve as adequate media of the 'universal truths' of European science was rooted in the judgements of European philologists in the employ of the East India Company, who placed languages and the intellectual capacities of their speakers in a civilizational hierarchy that culminated in European modernity and scientific achievement.[6] Colonial philologists alleged that South Asian vernacular languages such as Hindi depended upon 'classical' languages like Sanskrit for their expressive capabilities and abstract vocabularies. By comparing these vernaculars and classical languages with English, these scholars established a 'lack' of appropriate words in their vocabularies for expressing the abstract scientific concepts denoted by English technical terms.[7] This colonial consensus around the absence of technical terms in the vernaculars thus came to define their powerlessness in the colonial episteme.

In addition to serving as sites of linguistic comparison, colonial-era lexicons also transformed multilingual South Asia into discrete 'linguistically defined "worlds"'.[8] In precolonial South Asia, particular linguistic registers had been used to perform specific tasks in particular contexts, and well into the nineteenth century, an individual could participate in multiple communities of knowledge, devotion, service, and literary taste, each with its own linguistic repertoire.[9] From the nineteenth century, different speech-genres and linguistic registers were reorganized into standard languages in dictionaries that reflected 'dominant cosmographies' and prevailing sociopolitical hierarchies.[10] Scholars have extensively debated the role of lexicography in the division of *hindwi*, a mutually 'intelligible language' into Urdu and Hindi, 'two competing linguistic registers' associated with rival religious and nationalist projects.[11] At the turn of the twentieth century, lexicographic genres which had served the imperial civilizing mission were repurposed by Indian elites to renegotiate the unequal power relations of the colonial episteme. Actors such as the language activists of the Nagari Pracharini Sabha imbibed the civilizing tenor of colonial philology and felt that their 'impoverished' languages were in need of improvement. By the early twentieth century, the 'scientifically' produced 'modern' dictionary had in fact become a desideratum for any group claiming the status of nation on the basis of linguistic cohesion.[12] Alongside dictionaries, glossaries of vernacular technical terms came to be regarded as the 'key' to liberating modern scientific knowledge that was otherwise

'locked up in a foreign language' and therefore inaccessible to the majority of colonial subjects.[13] Lexicons, once the instruments of colonial rule, became tools for shaping the political communities commanded by linguistic nationalism into science-literate publics.

The Sabha pro-actively used lexicography as tool of linguistic assertion within its wider programme of language reform. For example, it published a monumental dictionary, the *Hindi Shabdasagar* (1908–29) with the intention to safeguard Hindi's national literature for future generations.[14] Notably, the society set about making a scientific glossary a whole decade before it ventured into the *Shabdasagar*. In the words of Shyam Sundar Das, the Sabha's secretary who presided over both these lexicons as their general editor, the *HSG* was produced to 'assimilate and bring into our language all the scientific ideas of the West.'[15] This aspiration was not limited to Hindi intellectuals alone. In fact, terminologies similar to the *HSG* were coined in multiple South Asian languages from the late-nineteenth century.[16] Moreover, even though the *HSG* was a bilingual glossary, the Sabha's lexicography was carried out in a multilingual imaginary by drawing upon experts and opinions in other regions and languages.

This article takes a 'multilingual perspective' and situates the glossary's history with respect to comparable projects of science translation in other South Asian languages.[17] It analyses the *HSG* not as an exceptional text of Hindi nationalism alone, but as an exemplary archive of the linguistic, epistemic and political strategies by which Indian elites attempted to transform their languages into effective media for science and mass education. In the first section, I examine the colonial inheritance of Indian projects of translating science, and compare an influential scheme outlined by the Bengali polymath Rajendralal Mitra in Calcutta with the translation strategies of European educators in Delhi and Benares. Second, I look at lexicography in action as the Sabha set about making an authoritative scientific glossary – a genre that was in fact recommended by Mitra. In the third and final section, I turn to the *HSG*'s inner archive of draft lists and intermediate debate to study an individual translator's strategies for rendering European chemical nomenclature in Hindi. My argument proceeds from an intellectual genealogy of the glossary and a micro-history of the Sabha's language activism to the linguistic labour of constructing equivalences between Hindi words and English technical terms. Terminological equivalents do not exist in 'some one-to-one relationship with their foreign counterparts' and in practice, translation rarely proceeds through 'a straightforward correlation of words, phrases, or even sentences.'[18] In fact, linguistic equivalence has to be constructed word by word, and as terms are translated, any equivalence drawn comes to be debated, reformulated and justified within existing linguistic, epistemic and sociopolitical hierarchies.

Technical terms and the Indian learner: the 'engraftment' of European knowledge on South Asian languages

Rajendralal Mitra's *Scheme for the Rendering of European Scientific Terms into the Vernaculars of India* (1877) is recognized by historians of science and colonial modernity as a key moment, marking the earliest Indian intervention in nineteenth-century discussions of the translation of European scientific and medical knowledge.[19] Until then, vernacular terminology had been a problem of colonial pragmatics, debated by Europeans interested in the scientific and medical education of their Indian subjects for exigencies of colonial rule.

Two preliminary questions animated the translation projects of most European educators. First, which language ought to be selected as the medium of new knowledge for existing knowledge communities? Second, should the technical terminology of European sciences be transliterated or translated into South Asian languages? In the early nineteenth century, European educators in charge of state-sponsored institutions resolved these questions in light of the linguistic repertoire and social roles of the Indian learners in their charge. Their pupils included highly literate social elites such as brahman pandits, but also medical students expected to assist European surgeons in maintaining the health of Company troops. By the late-nineteenth century, state education policy

extended beyond social elites, and regional literary spheres emerged as parallel avenues for acquiring new knowledge in the vernaculars. Indian elites who sought to promote science within their programme of education in the vernaculars were forced to reckon with the problem of technical terms. Mitra, and later the lexicographers of the *HSG* inherited many of the translation strategies of colonial educators.

Two different visions of empire and the education of India existed from the late eighteenth century – one that favoured the patronage of South Asian languages and oriental learning (the orientalist), and the other which believed in the improvement of colonial subjects through the moral force of Christianity and European learning taught in English (the anglicist). The Charter Act of 1813, contradictorily, incorporated both these visions. The Company was instructed to support both the revival of traditional learning, as well as the introduction of European science in public education. At this stage, it was taken for granted that the diffusion of the European sciences would occur through close contact between traditionally educated Hindu and Muslim scholars and Europeans trained in high prestige languages such as Sanskrit, Arabic and Persian – an attitude and practice characterized as the 'engraftment' of European learning upon traditional knowledge.[20] By the 1830s, a small group of Europeans proposed a shift away from these languages and instead advocated the use of the vernaculars as the media for the diffusion of European learning and its implementation through a government-aided system of mass education.[21] Despite Macaulay's infamous minute of 1835, the anglicists did not triumph and over the second half of the nineteenth century, the imperial vision of education increasingly extended beyond traditional elites to include the masses of Indian society. Wood's despatch of 1854 laid down that European knowledge should be taught in the vernaculars for it to reach 'the far larger class who are ignorant of, or imperfectly acquainted with English.'[22]

These debates played out with regional variations at state-sponsored educational institutions in northern and eastern India in the first half of the nineteenth century, where European educators adopted their own translation strategies. At Delhi College, orientalist learning combined with a western-style curriculum was taught to Hindu and Muslim pupils drawn from the urban upper classes in their common vernacular, Urdu. For Felix Boutros (d.1864), the college superintendent from 1841–45, European learning was best transmitted to such pupils in Urdu through translations from English. He considered English to be the most suitable '"feeder language" for the introduction of scientific terminology into Urdu', and held Urdu to be 'the most appropriate vernacular' to absorb European knowledge.[23] According to Boutros, Urdu's long history of borrowing from other languages, such as Arabic and Persian, made it especially receptive to foreign nomenclature. In contrast, James Robert Ballantyne (1813–1864) who superintended the Benares Sanskrit College from 1846–61, held that English technical terms had to first be rendered into Sanskrit, the language revered by his pandit pupils as the ultimate source of authoritative knowledge.[24]

Although Boutros and Ballantyne selected different languages as the media of European knowledge, they held that when 'attested "scientific" terms' were found in Urdu and in Sanskrit, they ought to be maintained.[25] Overall, they both believed that the resources of South Asian languages had to be 'developed' in order to express western scientific knowledge – in one case, through the 'engraftment of technical terms directly from English' into Urdu, and in the other, by creating new terms in Sanskrit.[26] Boutros and Ballantyne grappled with the transliteration of English technical terms in different ways. Boutros saw no problem in accepting an English technical term transliterated into Urdu when no direct Urdu equivalent was available. On the contrary, Ballantyne felt that transliteration led to the 'barbarization' of the language into which such terms were imported. He took advantage of the large number of roots available within Sanskrit to coin new terms and constructed a comprehensive vocabulary for chemistry in Sanskrit textbooks. Ballantyne tried to create a 'self interpreting' system of nomenclature, so that the Sanskrit neologisms constructed by him also conveyed the meaning of the corresponding English terms. For example, he translated hydrogen as '*jalakara*,' or 'the generator of water', and nitrogen as '*jīvāṅtaka*', 'that which puts an end to life.' Such neologisms were then given further currency in Hindi textbooks and dictionaries

prepared by his pupils.[27] The strategies preferred by these European translators not only shaped the wider politics and practice of language and translation in colonial pedagogy, but also defined the kinds of questions faced by Indian translators like Mitra and the Sabha's lexicographers in the following decades.

Technical terms also presented a problem at institutions of medical education, where Indian students were trained to assist European surgeons and meet the needs of a still-expanding military state. At the Native Medical Institute (NMI) established in Calcutta in 1822, students expected to be 'able to write Hindustani in both the Persian and Nagri letters' were taught pharmacology, *materia medica*, physiology, and anatomy alongside knowledge of the Ayurvedic and tibb systems of medicine.[28] Medical vocabularies first emerged alongside the production and translation of text-books in this context, and continued to circulate in the proliferating medical print market in nineteenth-century Bengal.[29] For instance, a multilingual vocabulary of technical terms pertaining to the human body, which provided Arabic, Persian, Hindi, and Sanskrit equivalents for English terms was compiled by the NMI superintendent Peter Breton.[30] In 1835, the NMI was replaced by the Calcutta Medical College (CMC) due to Macaulay-era cutbacks. Medicine was henceforth to be taught in English, with added emphasis on human dissection. However, in spite of the emphasis placed on English in official policy, the vernaculars continued to be essential media for educating native doctors. Secondary classes which offered instruction in Hindustani and Bengali were introduced at the CMC from 1839 and 1853 respectively.[31]

When the Government of Bengal appointed a committee to evaluate the vernacular textbooks used at the CMC in 1871, Rajendralal Mitra (1824–91) was among those asked for their opinions. Mitra, a leading member of the political and intellectual life of Calcutta, belonged to the first generation of Bengali commercial and landed elites who had been exposed to European-style education as well as traditional scholarship. He was a prominent landlord, philologist, antiquarian, and publisher, and one of the first Indians to be accepted as member of the Asiatic Society of Bengal.[32] Mitra's scheme, unlike those of European educators in Calcutta, Delhi, or Benares, was a thoroughgoing reappraisal of the problem presented by European technical terms for Indian learners from a 'native standpoint.'[33] His scheme also marks a foundational moment in a genealogy in which the glossary emerges as a genre key to epistemic transformations in a colonial world altered by the powers of modern science and English.

Mitra challenged 'the claim of English to act as science's universal vehicle,' a claim that would continue to be contested in subsequent decades.[34] His own translation strategy was outlined with respect to two vernaculars, Bengali and Urdu.[35] Unlike Ballantyne, he believed that translation from English into these languages did not require mediation by Sanskrit. Arguing against the anglicist position, Mitra opposed importing European technical terms into South Asian languages wholesale. He upheld 'scientific precision' as the goal of translation in vernacular textbooks and stated a clear preference for translation over transliteration.[36] At the same time, the flexible yet structured scheme he proposed allowed textbook writers to choose between translation and transliteration as needed. His scheme's guiding principle was the context in which technical terms were *used*, and the purpose they were intended to serve for the Indian learner of European scientific and medical knowledge.

The Indian learner expected to use technical terms at the CMC differed substantially from the ideal pupil of the Benares college. For Ballantyne, educating pandits in science was merely the first step towards their acceptance of the truths of Christianity. Pandits reformed and improved in this manner would themselves serve as missionaries of science and religion for the Indian masses. In contrast, Mitra's scheme focused not on traditional elites, but on the student learning medicine in the vernacular at CMC who would assist European surgeons or use this new knowledge to treat Indian patients. He aimed to help this learner retain not just terms, but also grasp the scientific concepts and principles embedded in them. Mitra's scheme was based on an understanding of terminology as a practical problem; as a question of *language in use*. Accordingly, he deployed translation and transliteration tactically and at times, even as parallel strategies.

As a precursor, Mitra raised a disarmingly simple question: what was a technical term? As he pointed out, 'many ordinary everyday words become technical under particular circumstances.'[37] Therefore, what made any word a technical term was the context of its use. Mitra accordingly grouped technical terms into six classes. He advocated the strategic translation or transliteration of terms in a given class depending on the context in which the word was used and how it would be most useful to the Indian learner.

In the first class Mitra placed ordinary words that were only occasionally used as technical terms – words such as thigh or blood in anatomy; or gold and silver in chemistry. He recommended that such terms be always translated, since 'well known, well understood' equivalents existed in Bengali and in Urdu.[38] Next, Mitra dealt with what he called 'crude nouns and generic names of objects' – words that lay 'on the debatable ground between science and ordinary language' and acquired a quasi-technical character in use.[39] Words of this class, such as muscles in anatomy or the names of crystals in chemistry, needed to be understood and not just memorized. Therefore, Mitra reasoned, they had to be translated. For such medical terms as names of diseases and their symptoms, he in fact recommended that Indian students learn their English and Latin names, as well as their vernacular equivalents.[40]

Mitra tactically varied his recommendation between translation and transliteration, as demanded by the context. His third class of words included 'scientific crude names.' These were words in which some quality of the object referred to had informed the meaning of the term when first formed, but over time, this etymological meaning had been lost. As examples, Mitra pointed to the names of elements in chemistry, or words such as quinine in botany. He noted that Ballantyne had been in favour of translating terms such as chemical elements. Mitra, in contrast, argued for their transliteration, suggesting that it would aid their use with precision. Similarly, he recommended the transliteration of 'scientific double names of plants and animals' such as *Jonesia asoka, Coius bhekti* placed in the fourth class, to aid precise identification of the species and genres of the natural world. Transliteration was also advocated for the names of foreign surgical and other instruments, and for chemical symbols. The strategic movement between translation and transliteration had a practical aim, to ensure a comprehensive medical education for Indian learners. Whenever the context demanded a deep understanding of concepts over rote learning, Mitra prudently changed his recommendation to translation – as in the case of words that described functions, processes, and abstract ideas in the sciences (crystallization in chemistry, or germination in botany), and anatomical and chemical compound terms.[41]

Mitra made two final recommendations to the committee in charge of examining vernacular textbooks which would have long-lasting consequences. First, he advocated that a committee of experts should prepare a set of rules to guide translators and textbook-writers. Second, he advised that complete glossaries, which contained all the principal terms needed in scientific and medical translation, along with their vernacular equivalents and transliterations, should be produced.[42] Taken together, these recommendations effectively upheld such glossaries, produced by collective expertise, as the ideal genre for mediating the authoritative assimilation of European scientific knowledge into the vernaculars.

From the mid-nineteenth century, Indian authors took advantage of the burgeoning print market in the vernaculars to communicate scientific and medical knowledge to emerging readerships in a range of published formats.[43] At times, they grounded their terminologies in earlier European efforts. For instance, Ramendra Sundar Trivedi (1864–1919), a science professor at Calcutta's Ripon College who was also a prominent Bengali essayist used Breton's 1825 vocabulary as a starting point to decide on the appropriate Bengali equivalent for names of diseases such as *cholera morbus*.[44] Budding science writers looked up such vocabularies to supply them with the very terms they needed to write on scientific subjects in the vernaculars. *HSG*'s editor Das reported that 'whenever a gentleman was asked to write an article or a book on scientific subjects he expressed his willingness to do so, if the Sabha could undertake to supply him with the vernacular equivalents.'[45] As the idea of mass education in the vernaculars gained ground in official circles and in regional

literary spheres, vernacular technical terminology came to be regarded as essential for the proliferation of scientific discourse and for science education. Glossaries, as the source list of such terms, held out the hope of bringing into being the authors and readers of a vernacular science-literate public.

The genre of the glossary, as recommended by Mitra, proved to be highly influential in subsequent decades, when a new relationship to language marked by an emotional commitment to linguistic identity and a new belief in universal translatability appeared in South Asia.[46] The creation of literary societies such as the Nagari Pracharini Sabha and the Bangiya Sahitya Parishad in Benares and Calcutta in the same year (1893) was itself an indicator of this historical development.[47] In this mode of thinking, 'anything that could be said in one language could be said equally effectively (if not as elegantly) in any other language.'[48] For a new generation of Indian intellectuals who targeted language and society as domains of vigorous reform, glossaries would source the very words with which the European sciences could be translated, taught, and learned by the Indian masses. Mitra had believed that such glossaries would not be products of 'gratuitous labour', but he was soon to be proven wrong.[49] Language activists and reformers turned to lexicography voluntarily, as a 'labour of love' in the service of language and linguistically-defined political communities.[50] They embraced translation and the proliferation of scientific discourse as duties to remove the perceived shortcomings of their languages, and argued that the vernaculars could serve as able media of administration, education and science, just as effectively as English.

When the Sabha turned to produce a Hindi scientific glossary in 1898, it was one amongst other lexicographic ventures of its kind. Mitra's endorsement of glossaries created by experts, although unheeded by the colonial state, had important ramifications in the regional literary spheres. Across the subcontinent, terminologies similar to the *HSG* were coined in Gujarati, Marathi, Bengali, Telugu, Tamil and Urdu from the 1880s. In fact, the Sabha self-consciously connected its glossary with the translation projects of Indian intellectuals in other regions. For instance, in the princely state of Baroda, a college teacher and chemist, T. K. Gajjar set out to produce a 'Vernacular Thesaurus' of Gujarati and Marathi technical terms, and in Calcutta the Bangiya Sahitya Parishad published its own lists of Bengali technical terms. The Sabha used these Bengali equivalents as a model and invited Gajjar to participate in the making of its glossary.[51] Other Indian intellectuals in turn looked up to the pioneering efforts of the Bangiya Sahitya Parishad and the Nagari Pracharini Sabha. When the Andhra Sahitya Parishat proposed to bring out a Telugu scientific glossary, its members corresponded with Hindi and Bengali intellectuals to seek their advice.[52] Although it is difficult to establish that Mitra's scheme inspired each of these efforts, it is clear that Indian intellectuals espoused terminologies and glossaries as the ideal genre to assimilate European scientific knowledge in the vernaculars.

The making of the *Hindi Scientific Glossary*: crafting cultural authority in an inter-regional, multilingual imaginary

Although published in 1906, the *HSG* had been in the making since 1898. A micro-history of the glossary's production reveals a text which was the result of methodical planning, collaborative work and multiple authorship. Lexicography demanded multiple stages and procedures, beginning with the establishment of a lexical field within which equivalences were constructed, followed by consultation and revision leading up to final publication. At each stage, the glossary's makers tried to ensure that it would be an authoritative text, capable of bolstering the powers of Hindi and strengthening the Sabha's own credentials in an inter-regional, multilingual imaginary. The Sabha used the glossary to enlist support for the cause of science and national education in the vernacular not only in the Hindi networks centred on Benares but also amongst educated, reform-minded

Indian intellectuals located in other regions. A close study of the stages, procedures, and personnel involved in the lexicographic process reveals the possibilities, limits and particularities of Indian approaches to science translation as shaped by the colonial episteme.

The Sabha's lexicography proceeded in the following stages. In 1898, the Sabha first appointed a committee to devise a workable scheme for the preparation of a scientific glossary. The disciplines selected broadly reflected the sciences introduced at western-style universities and colleges from the mid-nineteenth century.[53] By 1901, English technical terms belonging to these disciplines that would need to be translated were identified, and then entrusted to translators who had been hand-picked by the Sabha. These translators then prepared 'tentative terminologies'; that is, provisional lists of the Hindi words they had chosen as appropriate equivalents. Between 1901 and 1902, the Sabha published these interim lists of English terms and Hindi equivalents and invited 'constructive criticism' from interested parties. These lists were then reviewed and amended by revision committees between 1903 and 1904, and revised editions for each discipline were published between 1904 and 1906. The final step in this gradual, stage by stage execution of lexicography was the publication of a consolidated edition of the *HSG* in 1906. The finished glossary consisted of 359 pages and included lists of all seven sciences; terms and equivalents were organized by discipline and arranged alphabetically. The glossary's completion was announced in the act of consolidation, and even more so in an accompanying preface, which meticulously recapitulated the history of the glossary's production.[54]

This lengthy preface, composed notably in English, also serves as a self-reflexive archive of the glossary's own making. Shyam Sundar Das used it to put on record a comprehensive account of the *lexicographic method* followed by the Sabha. He scrupulously chronicled multiple stages and procedures, and listed the names of all contributors, translators and editors who served on various committees of organization, translation and revision. Das also recounted the glossary's genealogy, connecting the *HSG* with colonial education policy and with the translation projects of Gajjar and the Bangiya Sahitya Parishad. At the same time, he presented the Sabha's lexicographic process as far more comprehensive than all preceding efforts to produce vernacular nomenclature.

By documenting and amplifying their lexicography in an English-language preface, the Sabha simultaneously addressed multiple audiences and constituted them as the publics of science in the vernacular. These publics included a Hindi elite well versed in English, who could be motivated to write on scientific subjects in new periodicals and also produce textbooks. At the same time, the Sabha sought to attract an inter-regional public comprised by educated Indians who were interested in the cause of language reform. The preface also announced to colonial educators and European philologists these Indian intellectuals' collective will to linguistic emancipation. Translators such as Boutros and Ballantyne had derived their authority from their philological expertise and their position within the colonial education bureaucracy. Their translation strategies had been upheld by the colonial state in its education policy and influenced the production of textbooks and other pedagogical materials.[55] In contrast, as a lexicon planned and executed by Indian agency, the glossary was an assertion of linguistic authority, through which native elites seized the right to create the words for generating scientific discourse in their 'own language'. The Sabha therefore portrayed the production of a methodically produced modern lexicon as a signal achievement. The glossary's preface archived the deliberate proceduralism with which the Sabha went about lexicography, as if to pre-emptively answer the charge that natives could not give themselves a vernacular terminology.[56]

The Sabha tried to secure the foundations of the glossary by first establishing a comprehensive list of essential terms for translation, and by choosing reliable translators who commanded cultural authority. But before these translators could construct Hindi equivalents, it was necessary to identify the English words that adequately represented the lexical field of each of the seven disciplines selected by the Sabha. In an unlikely move, the committee charged with this task turned neither to canonical works of European science nor their popular iterations but in fact, to a dictionary. Volunteers combed through *Webster's International Dictionary* and collected the

technical terms that would then be translated into Hindi. Although their choice may now seem quixotic, respectable contemporaries in other regions had followed the same strategy. For instance, T. K. Gajjar had first used *Roget's Thesaurus* and then the same *Webster's* to unsuccessfully prepare a technical thesaurus of Marathi and Gujarati equivalents; the Sabha was aware of this project.[57] Ironically then, Indian intellectuals who sought the words required to develop a capacity for vernacular scientific discourse turned not to English scientific discourse and its technical literature but to a dictionary at hand. Their lexical imaginary thus reflected the limits imposed by the colonial episteme on who could access science, and literally, on whose terms. The vernacular scientific imaginary also turned on the colonial book trade and culture of scientific publishing, and what was available as authority-at-hand even at a large urban centre such as Benares. The provenance of their chosen dictionary may also have guided the Sabha's language activists. *Webster's* was an English-language dictionary produced not in Britain but in the once-colonized, now-independent United States of America. In reaching for *Webster's*, and not the *Oxford English Dictionary*, arguably the glossary-makers sided with the English of the post/colonial market, not the language of imperial command.

For the *HSG* to be a commanding text, its translators had to be trustworthy arbiters of linguistic authority and literary taste who could guarantee that the most appropriate Hindi equivalents were selected. At the turn of the twentieth century, few Indians could aspire to the status of natural philosophers, men of science, or scientists. The list-makers, translators, and editors who contributed to the glossary were drawn from the new intellectual classes shaped by colonial-era transformations. The skills, reputations and cultural authority of these contributors rested in institutions that had emerged concomitantly with colonial modernity, such as state-sponsored institutions of Sanskrit learning, the literary-political society, the regional public sphere and the university. Figures with new cultural roles in colonial society, such as the 'new pandit', school teachers, university graduates, and journalists wrote in newly-created periodicals, translated scientific knowledge (from the Sanskrit śāstra and the European sciences) and participated in the Sabha's lexicography.[58] At the same time, these very actors helmed ongoing linguistic reform, laid down rules of grammar and idiomatic language, and forged a literary and political community shaped as much by their opposition to Urdu, as by their privileged-caste political and aesthetic commitments. Thus literary innovation, linguistic standardization, lexicographic experiments, and science translation proceeded simultaneously.

In its choice of translators, the Sabha sought to incorporate the skills and prestige of eminent Sanskrit scholars as well as the emerging figures of print journalism. For instance, Sudhakar Dwivedi (1860–1910), a reputed scholar of the Sanskrit astral sciences (*jyotiḥśāstra*) and professor of astronomy and mathematics at the Benares Sanskrit College was invited to translate the terms of astronomy and mathematics. The Sabha asked Mahavir Prasad Dwivedi (1864–1938), a government employee in the Indian railways who had established a reputation for himself as a translator and literary critic, to render the terms used in philosophy. Both men were brahmins, but they had taken different routes to acquiring knowledge, cultural authority and renown in the Hindi-Hindu intellectual milieu in north India. Sudhakar was a beneficiary of the colonial patronage of Sanskrit scholarship and also participated in the highest echelon of the education bureaucracy open to few natives, as a Fellow of the University of Allahabad.[59] In contrast, Mahavir Prasad's rise was tied to the emergence of new liberal professions and new cultural roles for didactic editors and exhortatory writers. As long-serving editor of the premier Hindi monthly *Sarasvati*, Mahavir Prasad shaped literary, political, and social opinions in the Hindi public sphere in the first two decades of the twentieth century.[60] Sudhakar and Mahavir Prasad's participation in the Sabha's lexicography added to the appeal, value and authority of their glossary.

The Sabha's approach to lexicography was geared towards demonstrating that their lexicon was the product of due process. As a result, they adopted a number of strategies to establish that although individual translators were responsible for choosing equivalents, their selected terms enjoyed wider acceptability and linguistic consensus. The Sabha therefore instructed translators

like Sudhakar and Mahavir Prasad Dwivedi to prepare 'tentative terminologies' which were then discussed, debated, revised, and eventually compiled by 1906. By choosing translators from the Hindi literati, the Sabha had already enlisted their support. They also desired the support of Indian intellectuals from other literary spheres with shared ambitions of linguistic empowerment. For instance, the Sabha had invited Madhav Rao Sapre, a writer of some repute in Marathi as well as Hindi, to translate terms of political economy. At the same time, the Sabha wanted to bring the glossary to the attention of the colonial state and especially its provincial education departments who were responsible for overseeing vernacular education and preparing textbooks in different parts of the subcontinent.

The Sabha took several measures to mobilize these different publics in support of the *HSG*. First, all 'competent persons' were invited to provide 'constructive criticism' of the tentative terminologies.[61] Thus in principle, not only the Hindi literati but anyone interested in the question of scientific discourse in Hindi, or the problem of national education in the vernaculars more generally was asked for their opinion.[62] Then, in a manner mimetic of colonial practices of procedurally establishing authority and approval, the Sabha sought the help of the education departments of Bengal, Punjab, the Central Provinces, and the United Provinces and asked their officials to join its revision committees. The Sabha thus used publishing networks and issued calls for criticism and collaboration. It also made overtures in person to experts in other regions. While plans were being made for the revision process in Benares, the Sabha sent Madhav Rao Sapre to Bombay and Poona, and Shyam Sundar Das himself travelled to Calcutta. Sapre and Das aimed to 'interview all the well-known scientists and scholars' in these cities and to discuss the tentative terminologies with them.[63] Among those Das contacted were the prominent scientists Jagdish Chandra Bose and Praffula Chandra Ray at the Calcutta Presidency College, and the essayist Ramendra Sundar Trivedi who had translated technical terms for the Bangiya Sahitya Parishad.[64] In the preface, their names were enlisted and their reputations attached to the making of the glossary.

Although the *HSG* was a bilingual text, a site for moving scientific meaning from English to Hindi, the Sabha's lexicography and public-building took place within an inter-regional and multilingual imaginary. Texts, material resources, volunteering members, and expert opinions were mobilized across a wide geography of knowledge. In comparison, the translational projects of Boutros and Ballantyne appear to have been strictly local even when backed by the colonial state. Even Mitra, who had expressed great exhilaration at the possibility of creating a system that was 'thoroughly national and perfect' had proposed a scheme that ultimately focused upon medical education in two vernaculars – Bengali and Urdu.[65] In contrast, the Sabha used the mobility of texts and persons to rally intellectual support and voluntary assistance from other regions, and presented a vision of terminology that was at once vernacular and multilingual.

This vernacular yet multilingual vision was outlined in the principles established by the revision committee which met in Benares in 1903–1904 to review and rework the tentative terminologies. The committee was dominated by Hindi intellectuals but in early 1904, it was joined by two scholars who had translated technical terms in Gujarati and Marathi. Thus T. K. Gajjar, the chemistry professor in charge of producing textbooks on technical subjects in Baroda, and N. B. Ranade, a small-town teacher who compiled an English-Marathi dictionary with a large number of technical terms arrived to assist the Sabha.[66] While the tentative terminologies had been the work of individual translators for each discipline, the principles drawn up by the committee were meant to guide the revision of the lists as a whole. These principles laid down the parameters within which the appropriateness of the equivalents proposed by individual translators would be evaluated, amended and streamlined. In revision, the final stage of the Sabha's lexicography, the subjective choices of translators would thus attain the objective order of the modern glossary format.

The revision committee advocated that when seeking appropriate Hindi equivalents for English technical terms, in the first instance preference would be given to 'common and current Hindi terms.' Thus far, the premise of the committee's recommendations broadly matched earlier

schemes; recall for example Boutros and Ballantyne's inclination to maintain current terms, in Urdu and in Sanskrit. The Sabha's revision committee thereafter introduced a clause which marked a major departure from prior schemes, European or Indian. In the event that no Hindi equivalent was available for an English term, the committee proposed to seek out similarly appropriate terms in other vernaculars. The languages specifically mentioned were 'Marathi, Gujarati, Bengali and Urdu.'[67] Thus far, the Sabha had performed its language activism in a multilingual imaginary, but this clause introduced a pragmatic dimension to their professed multilingualism. Even Urdu was now included as a reference point. As a final recommendation in these guidelines for revision, the committee ruled that when Hindi and these other languages failed to yield equivalents, they would turn to Sanskrit and English. Then, they could either use existing Sanskrit terms or transliterate the English term, or they could choose to coin new terms from Sanskrit.[68] The committees further appointed for each of the seven disciplines were directed to follow these principles to revise the respective tentative terminologies.

Although the *HSG* was meant to provide Hindi equivalents for English technical terms, these principles expanded the linguistic field within which equivalences between English and Hindi could be constructed. They appeared to upend the language hierarchies instituted between English, Sanskrit and the vernaculars in the colonial episteme. In the rationale of the revision committee, the vernaculars were momentarily prioritized over Sanskrit and English; moreover, the committee introduced the notional possibility of inter-vernacular equivalence. These principles seemed to invert the belief in the lexical capacities and translational felicities offered by Sanskrit, held by orientalists like Ballantyne. Instead, by admitting the possibility for constructing equivalences between English and Hindi via existing terms in other vernaculars, the revision committee imputed that the vernaculars look to each other for meaningful resonance before turning to Sanskrit.[69] In fact, the translators of geographical and chemical terms had already used the lists of Bengali equivalents prepared by the Bangiya Sahitya Parishad as models for their own tentative terminologies.[70] The inter-vernacular resonance between these projects of terminology speaks to their shared colonial inheritance and common ambitions, and to the 'coeval' histories of Benares and Calcutta.[71]

Constructing equivalence: chemical nomenclature in Hindi

Between its tentative terminologies, revised lists, and subsequent consolidation, the *HSG* secreted an archive of the dilemmas and aspirations embedded in the project of vernacular nomenclature. The Sabha's multi-stage lexicographic process resulted in a series of intermediate texts, each organized by discipline. In most cases, the resulting text at the end of each stage took the form of parallel word lists. These lists followed the linear alphabetical arrangement utilized by colonial-era lexicons, unlike precolonial lexicons which were written in verse and arranged topically. This linear arrangement gave the impression that English and Hindi were somewhat equivalent to one another and proposed interchangeability between their respective vocabularies.[72] The tentative terminologies for astronomy, mathematics, philosophy, and political economy were thus organized alphabetically.[73] Occasionally, these provisional texts carried a preface in which translators explained their approach to the translation of scientific nomenclature.[74] The *Chemical Terminology* diverged from the other tentative terminologies. It had not one but two prefaces. Its constitutive word lists were arranged topically – names of elements, followed by other compounds, with a further list of miscellaneous terms; under each of these topics, terms followed an alphabetical order. The word lists were also surrounded by brief notes in which the translator, a university graduate named Thakur Prasad explained how he had arrived at his chosen equivalent and even gave reasons to support his choice (Figure 1). Prasad laid out his approach to chemical nomenclature and translation more generally in a preface written in Hindi. When published in 1901, his

मूल पदार्थ ।

(Elements. = मूल पदार्थ)

1. Aluminium=फटिकम फ

यह धातु Alum से उत्पन्न होता है और Alum को स्फटिक वा फिटकरी कहते हैं इस कारण से Aluminium को हम "फटिकम" कह सकते हैं।

2. Antimony, Stibium } =अञ्जनक अ

इस का दूसरा नाम Stibium अभी तक प्रचलित है और हिन्दी में इसे अंजन कहते हैं। वैद्यक शास्त्र में यह चार प्रकार का वर्णित किया गया है। साधारण में अञ्जन का अर्थ सुर्मा है। इसलिये सुर्मा वा रसाञ्जन यदि इस का अर्थ किया जाय तो Sulphide of Antimony का परियायवाची होने से भ्रममूलक होगा—अतएव अञ्जन वा "अञ्जनक" इसका अर्थ किया जाता है।

3. Argon=आर्गन आ

यह पदार्थ थोड़े दिन हुए कि आविष्कृत हुआ है। इस में परिवर्तन की आवश्यकता नहीं है।

4. Arsenicum=तालक ता

पहिले Arsenic से संखिया विष समझा जाता था। यह द्रव्य हरताल व गोदन्त में अधिक होता है और हरताल को Orpiment कहते हैं। गोदन्त एक श्रुतकटु शब्द है इससे इसके लिये "तालक" शब्द अच्छा होगा।

5. Barium=भारक भ

Barium शब्द लाटिन भाषा के barus शब्द से निकला है जिसका अर्थ भारी है। और Barium Sulphate अथवा heavy spar के क्षार को borate वा baryta कहते हैं और इसीसे यह पदार्थ उत्पन्न है। अतएव इस के लिये "भारक" शब्द अनुचित न होगा।

Figure 1. List of elements in the *Chemical Terminology* (1901), annotated with Thakur Prasad's notes, explaining his translation strategy.

list, notes and preface were accompanied by another preface, written by Shyam Sundar Das in English.[75] The tentative terminologies, like the consolidated glossary of 1906, addressed multi-lingual publics.

The *Chemical Terminology* offers the most direct statement by one of the *HSG*'s translators of the strategies used for rendering the nomenclature of a single scientific discipline in Hindi. What did Prasad, an Indian science learner much like the archetypal addressee envisioned for the glossary, and himself a translator, regard as the core content of a new branch of knowledge such as chemistry? How could this core content be relocated amongst a new linguistic community in the process of creating vernacular nomenclature? Chemical nomenclature is ideally suited for such an investigation, since language and naming are central to the ways in which modern chemistry makes sense of new substances discovered or invented in order to distinguish them from those already known and familiar. In addition, the *Chemical Terminology* offers a way of understanding how inter-vernacular resonance worked in practice between parallel projects of translating science into South Asian vernaculars. Prasad drew upon Ramendra Sundar Trivedi's list of Bengali equivalents for the names of elements as model for his own list, and explained his reasons for accepting and adapting Trivedi's terms or for digressing altogether. A close reading of the *Chemical Terminology* thus provides the rationale for Prasad's equivalences and their fate when it came to the revised and final glossary.

In his preface, Prasad observed the distinctiveness of chemical nomenclature amongst the language of all other European sciences. Its peculiarity for him lay in the fact that even small changes to an ordinary word (*sādhāraṇa śabda*) produced a whole range of chemical terms – each with a distinct meaning, referring to very different products that resulted from distinct chemical processes. Modern chemistry and its nomenclature have evolved steadily since the eighteenth century. The 'chemical revolution' of the late-eighteenth century that led to the gradual adoption of the oxygen theory of combustion has been regarded as much as a transformation of chemical theory as of chemical language. Beginning in France in the 1780s, the inauguration of a new nomenclature came to define the language of modern chemistry. Designed by four French chemists in 1787 and consolidated in Antoine Lavoisier's definitive textbook *Traité élémentaire de chimie* (*Elementary Treatise on Chemistry*) in 1789, the new chemical nomenclature was only gradually adopted by chemists in Europe. Rarely did the latter show 'a passive attitude of being simply receivers' of the French nomenclature. In some instances, the adaptation was limited, as in the case of the Spanish, Italian, Portuguese and English chemical communities which adopted the French terms with 'a simple phonetic adaptation.' Even within Europe, there were chemists who preferred to translate the French terms into their vernaculars, such as German- and Polish-speaking communities.[76] In the early nineteenth century, the Swedish chemist Jöns Jacob Berzelius developed a system of notation and formulae to describe the elements composing any chemical compound. In spite of the universality proposed by such chemical symbols, the diversity of languages used by different 'national' communities of chemists in Europe continued to be a significant factor in chemical practice and publications.[77]

European and Indian translators in South Asia were not only aware of the linguistic differences among European chemical communities but also deployed this linguistic diversity in their own arguments for the translation of European scientific knowledge into South Asian languages. Thus Ballantyne approvingly noted that the Germans had rendered the chemical terms into their own language in support of his own belief that Sanskrit terms ought to be coined for the Benares pandits.[78] Mitra gave examples of chemical terms in German, French and English to counter the anglicist argument that the transliteration of English terms into South Asian languages would create a common terminology in British India. As he demonstrated, there was no such 'cosmopolitan terminology' even amongst scientific communities in Europe.[79] At the same time, Mitra recognized that European chemical communities followed broad protocols for systematically generating names of chemical compounds and substances. The purpose of chemical nomenclature, he understood, was that 'names should be understood and not learnt by rote.'[80]

Prasad took a similar approach and declared that the rendition of chemical nomenclature into Hindi demanded the creation of a system (*praṇālī*) rather than a copious profusion of equivalents. If the rules by which European chemists named chemical elements and compounds could be transmitted to a system for generating names in Hindi, then translators familiar with European chemical nomenclature would be able to use the corresponding Hindi terms with ease as well as precision.[81] As a result, Prasad began his list with the foundational elements, then worked through the names of bivalent and polyvalent metals, their complex oxides, chlorides, fluorides, and nitrides, and the names of acids and bases. Alongside, he tried to communicate fundamental knowledge of the chemical processes which led to the production of particular compounds, and the system by which these compounds were named. This comprehensive nomenclature for inorganic chemistry was followed by a further list of miscellaneous terms related to the discipline. Prasad's text not only supplied chemical terms and their equivalents but it also gave its reader the explanatory context which was required to effectively translate chemical knowledge between English and Hindi. Although his list presumed that the reader had at least some prior knowledge of chemistry, Prasad's pedagogic instinct was evident at every stage. He provided examples, listed chemical formulas and English names, and explained the processes which gave rise to particular products and influenced their names. Throughout he guided the reader through the systematic generation of equivalents to be used for reading and writing about chemistry in Hindi.

Prasad, like Mitra, demonstrated a clear preference for translation over the wholesale transliteration of English terms. At the same time, he made tactical use of transliteration. Both strategies can be seen in the way Prasad rendered the names of chemical elements – which Ballantyne had preferred to translate and which Mitra had wanted to transliterate. Of the seventy elements on Prasad's list, less than ten names had been transliterated, and in some cases Prasad gave a justification for his choice. For example, Prasad transliterated the names of Argon, Bismuth and Platinum while he translated Niobium. In the case of Argon, its recent isolation/discovery (1894) appeared to be sufficient justification for transliteration. In the case of Nickel and Platinum, Prasad explained his use of their transliterated names on the grounds that these elements were becoming 'popular' in India at the turn of the twentieth century. However, novelty or discovery did not always prove to be sufficient reason for transliteration. In the case of Niobium – an element that was long confused with others in the nineteenth century, and officially given this name only in 1949 – Prasad chose to integrate its nineteenth-century discovery in the translation itself, calling it '*navaka*', or new.[82]

In the inter-lingual space within which Prasad constructed Hindi chemical nomenclature, although the Bengali equivalents promoted by the Bangiya Sahitya Parishad could be a valuable resource, Prasad neither mentioned Ballantyne's Sanskrit nomenclature nor made use of his neologisms. Even though Prasad chose to translate names of most elements like Ballantyne, he did not adopt the latter's translated nomenclature. For instance, Ballantyne had coined the neologism '*prāṇapada*' (that which gives breath) for oxygen, which Prasad translated as '*dāhaka vāyu*' (the air that ignites).[83] Even when there were only shades of differences between the meaning Prasad wanted to get at and the one Ballantyne had tried to integrate in his self-explanatory nomenclature, Prasad coined a new term. Thus, while seeking an adequate equivalent for Nitrogen, Prasad acknowledged that an excess of this gas extinguished a fire or a lamp. Ballantyne had rendered nitrogen as '*jīvāṅtaka*' (that which puts an end to life). Prasad coined a different neologism with a similar meaning – '*nirdyotaja*' (that which extinguishes a flame).[84] Apart from their shared location in Benares, no direct coincidence between these two European and Indian translation schemes is evident in the *Chemical Terminology*.

Equivalents crafted in one language could at times be sensible in other vernaculars in the inter-lingual space of science translation, but even then Prasad used Trivedi's Bengali names of elements selectively. In some instances, he accepted Trivedi's term without any significant change. For example, he simply observed that Phosphorus had been rendered as '*sphuraka*' in Bengali and since the word had a clear association to any Hindi speaker, he saw no need to choose a different

equivalent.[85] For Indian translators in Calcutta and Benares who perceived a common linguistic inheritance, their languages' shared descent could thus become a resource for mutual intelligibility, and for seeking inter-vernacular resonance of scientific meaning between Bengali and Hindi.

The shared translational ground sought out by translators between the vernaculars also had its limits. Prasad did not adopt the Bengali terminology wholesale and decided upon Hindi equivalents in light of lexical associations and cultural evaluations that would appeal to the Hindi science learner and translator. For example, when considering an appropriate equivalent for Bromine, he noted its Greek etymology (*broma* = smell) and the fact that the element had been named for its sharp odour. Trivedi had chosen to name it '*aruṇaka*' because of its bright colour like the sun (*aruṇa* in Sanskrit, Bengali and Hindi). Prasad noted that another translator, Kalidas (a figure not mentioned elsewhere in the text) considered '*brāhmiṇa*' a better equivalent for 'bromine', as something of a *faux amis* for its deceptive resemblance to the name of the element. Prasad weighed these different options. He declared that he preferred '*brāhmiṇa*' over '*aruṇaka*' (bright), because *brāhmiṇa* was connected with the god Brahma, also known for his red complexion. The term had the additional advantage that it did not require much change from the English name 'bromine.'[86] Prasad's choices were thus ultimately rooted in Hindi semantics and privileged-caste, Hindu aesthetic sensibilities. He repurposed '*aruṇak*' as an equivalent for Lithium, once again disregarding Trivedi's preferred equivalent for that element.[87] Trivedi had rendered Lithium as '*lohtika*', which Prasad explained, could be confused with the similar-sounding '*loha*', the Hindi word for iron.[88] Prasad thus prioritized the needs of the Hindi learner and chose equivalents that neatly avoided any such confusion.

The reception of newer forms of European scientific knowledge such as chemistry within existing cosmologies and epistemologies meant, as might be expected, that translators like Prasad translated European nomenclature within established fields of meaning. Although Prasad rendered chemistry as '*rasāyana*,' a term that harked back to premodern parachemical knowledge, his terminology largely focused on the nomenclature of European chemistry.[89] Older lineages of terms in Sanskrit *materia medica* (*vaidyaka śāstra*) came up occasionally as he reasoned one equivalent over another. For instance, when Prasad turned to find an equivalent for Antimony, he considered different lineages of the black, pigment-like substance so named in the European chemical tradition, known in Sanskrit as '*aṅjana*' and commonly available in north Indian markets as '*sūrmā*'. He recalled for his readers that Sanskrit *materia medica* described four different kinds of this substance. Balancing these different references, Prasad did not choose the common name but settled upon '*aṅjanaka*' to denote the element with a name that might stick with readers already familiar with these webs of association.[90]

The revision committee appointed to revise the *Chemical Terminology* included the Gujarati and Marathi translators Gajjar and Ranade. In revising Prasad's annotated tentative terminology to meet the linear order of the modern glossary form, these editors made several changes. One of the most significant changes was the introduction of the Berzelian symbol and the atomic weight of each element, in English as well as Hindi (Figure 2).[91] Elements in Prasad's list had been accompanied by a Hindi letter or ligature to facilitate their symbolic representation. Mitra had felt that there would be no difficulty in producing vernacular versions of English symbols which would 'prove much more intelligible and be remembered better than the English.'[92] Prasad, who had largely avoided transliteration, also steered clear of using Berzelian symbols in Roman script. The revising editors followed a middle path, including English symbols with an equivalent Hindi representation. They also discarded most of Prasad's translations of the names of elements. Instead, they chose to transliterate the English names or adopted them with minimal modifications. The editors explained that they had thus selected to adapt the Hindi names 'on the lines of English words so that translators may have no difficulty in using them.'[93] Broadly this change affirmed Mitra's assessment that the names of elements were better left transliterated. The editors removed Prasad's lengthy but essential discussion in which he had laid out the generation of names of oxides and other complex compounds. Instead, they replaced it with a list of the prefixes and suffixes used

THE

HINDI SCIENTIFIC GLOSSARY.

हिन्दी वैज्ञानिक कोश।

CHEMICAL TERMS.

रासायनिक परिभाषा।

I. THE ELEMENTS—मूलतत्त्व।

A

Aluminium, Al (27) = एल्यूमिनियम, एल्यू (२७)।
Antimony (Stibium), Sb (120) = एण्टिमनी, एण्ट (१२०)।
Argon, A (40) = आर्गन, आ (४०)।
Arsenic, As (75) = आर्सेनिक, र्स (७५)।

B

Barium, Ba (137) = बेरियम, बे (१३७)।
Beryllium, Be (9) = बेरीलियम, बे (९)।
Bismuth, Bi (208) = बिस्मथ, बि (२०८)।
Boron, B (11) = बोरन, ब (११)।
Bromine, Br (80) = ब्रोमिन, ब्र (८०)।

C

Cadmium, Cd (112) = कैडमियम, का (११२)।

Figure 2. Elements in the consolidated glossary (1906), the introduction of Berzelian symbols and atomic weight, and the erasure of explanatory text.

in such names. This list included prefixes and suffixes such as bi-, di-, hepta-, mono- and -ate, -ation, -ic, -ide, and their Hindi equivalents.[94] The ideal reader of the chemical terminology revised in this manner was imagined as someone who had already acquired chemical knowledge in English in a university classroom but who could be motivated to translate it for Hindi readers. Such a reader, who already understood the chemical compounds which these prefixes and suffixes named could then look up an already-established Hindi equivalent in the *HSG* and use it to produce vernacular scientific discourse.

The insight offered by Prasad's text into lexicography, inter-vernacular translation and the construction of equivalences through nomenclature is therefore all the more significant for its vanishing presence. In the process of revision, all traces of the translator's choices and dilemmas were removed by the committee in charge. The chemical terms included in the consolidated *HSG* of 1906 were presented as a list of authoritative equivalences, which gave no hint whatsoever of the process by which equivalence had been constructed in practice. Different stages of the lexicographic process were dictated by different logics: In the tentative terminologies, equivalences were constructed and reasoned in the interstitial space of interlingual intelligibility. The revision process, on the other hand, ultimately reduced these possibilities to the linear format expected of the modern glossary. The complexities of chemical nomenclature however could not be altogether contained within lists. The editors had to include a page-long 'notes for guidance' at the end of these lists of elements, miscellaneous words, prefixes, and suffixes to demonstrate the workings of equivalence with a few limited examples.[95]

Conclusion

How did Indian language activists claim the lexicographic authority to coin scientific terms in the colonial episteme? They tried to set out principles around which the lists produced by individual translators could be revised and made to cohere to the procedures and form of a modern glossary. They attempted to build multilingual publics for their lexicon and vernacular nomenclature, by seeking out criticism and even recruiting experts from other regions into committees which gave final shape to the glossary. Between 1904 and 1906, subcommittees for each of the seven disciplines revised the tentative terminologies, and these revised lists were then consolidated and published in 1906.[96] The post-revision consolidated edition of the *HSG* reveals that although Sanskrit neologisms were meant to be coined only after all other routes for seeking equivalents had been exhausted, they were used at least as often as other strategies. Tellingly, the equivalent for equivalence was itself such a neologism – *saṁyogaśaktisāmya*.[97]

The *HSG* can be constructively considered alongside other well-known cases of science in translation in non-western contexts. The literati of the late-Qing and Ottoman empires were faced with similar challenges in translating the vocabulary of the European sciences. At the Translation Bureau of the Jiangnan Arsenal established by 'self-strengthening' Qing bureaucrats in 1865, the Anglican missionary John Fryer together with the scholar Xu Shou translated chemistry textbooks. After creating and refining Chinese chemical terms in such textbooks, Fryer and Xu too came to use the genre of the glossary. Their nomenclature was consolidated in a glossary in 1885.[98] In Ottoman Egypt, the intellectual and civil servant Rifaah Rafi al-Tahtawi included extensive glossaries in his own translations of French works and also encouraged his students at the state-commissioned School of Languages (1836) to compile similar glossaries. Over time, he hoped, their efforts would lead to 'a full-fledged Arabic scientific dictionary.' By the 1880s, systematic Arabic vocabularies of technical terms translated from English, French, Latin and Greek were created and popularized in *al-Muqtataf*, a journal which became the vehicle of European scientific knowledge for Arabic readers in the late-nineteenth century.[99] Clearly, the genre of the glossary and the problem of terminology mark a key moment in the relocation of European scientific knowledge in colonial and non-western contexts.

In comparison with these projects, Hindi intellectuals in Benares regarded the production of technical terms as the condition of possibility for Hindi scientific discourse. Contemporaries in fact criticized the Sabha for 'placing the cart before the horse,' by creating a lexicon before there existed any scientific literature in Hindi.[100] Readers acknowledged that the assimilation of new knowledge required the expansion of Hindi's core vocabulary and new words would surely be needed. Some felt that this need was best addressed through sustained discursive practice, and urged Hindi authors to write essays, produce textbooks and translate scientific works. To do otherwise, as the Sabha had done, they argued, was contrary to the 'laws of nature' and the 'natural growth of

language.'[101] Although prominent periodicals such as the *Nagari Pracharini Patrika* and *Sarasvati* carried articles on medical and scientific subjects from the late-1890s, a full-fledged journal dedicated to promoting science in Hindi emerged only in the decade following the publication of the *HSG*. College teachers in neighbouring Allahabad formed the Vigyan Parishad (Vernacular Scientific Society) and in 1915, they began to publish the monthly *Vigyan* which regularly carried lists of technical terms.[102] The program of terminology, centred on the glossary genre continued to proliferate. By the 1920s, the standardization of Hindi scientific terminology had become a matter of public debate in newer forums like the Parishad and the Hindi Sahitya Sammelan (1910), who aspired to produce glossaries of their own.[103]

Science in translation in non-western contexts has often been demoted to a 'literary affair' or a matter of popular science. Writing in the 1990s, Jeremy Reardon-Anderson judged the Jiangnan translations to be 'rich in reading and writing, but poor in observation and experimentation, and in this sense not scientific at all.'[104] This 'literary bias' and lack of experimental engagement is arguably also true of the *HSG*'s translators and lexicographers. For unlike the French chemists who constructed their new chemical nomenclature in the 1780s, or the European chemical communities who adapted it to suit their 'national' contexts, the introduction of European scientific nomenclature into Hindi, Chinese and Arabic was indeed not the work of 'scientific practitioners.'[105] In the 1930s, when Indian scientists turned to communicate scientific news in the serialized format of periodicals like *Current Science* (1932) and *Science and Culture* (1935), they chose to do so not in the vernaculars but in English. *Current Science*, modelled on *Nature* and based at the Indian Institute of Science in Bangalore (1910), cost double the price of a Hindi monthly like *Vigyan* and primarily addressed fellow scientists.[106] The task of creating knowledgeable, science-literate vernacular publics remained to be carried out by other, 'non-scientific' actors, with different knowledge-language repertoires and other standards of cultural authority.

'The function of science writing in the Indian languages,' Partha Chatterjee argued in the mid-1990s, 'has been to make available at the lower educational levels and to the general reading public the materials of a "translated science".'[107] But how was modern science translated into these languages and made available for vernacular publics? Any analysis of these publics, their stratifications and sensibilities, demands far more attention to how science was in practice translated. Science pedagogy in Indian education, even in the early twenty-first century, continues to be beset with the problem of how scientific terms, concepts and theories are to be learnt in Hindi, or for that matter in any of the vernaculars.[108] For vernacular scientific publics to emerge, or for their robust presence in public life, vernacular terms had to be devised. In important case studies of the 'vernacularization' of modern science in colonial Bengal, Projit Mukharji has reasoned that the creative adaptation of new knowledge in a new historical context demands its cultural, ideological and material translation beyond the 'relatively simple process of linguistic translation.'[109] In this model, colonized subjects creatively adapted modern scientific knowledge and its practices by using familiar metaphors and local categories, and by embedding new concepts in local material culture and practices. Yet, the issue of terminology reveals that in the actual process of translation, equivalence had to be established at the level of the word itself. Far from being a matter of linguistic translation alone, the construction of word-level equivalence required linguistic, epistemic and political strategies to render nomenclature meaningful, stable and authoritative for its vernacular publics.

For the Sabha's volunteers in the cause of science in Hindi, the constitutive anxieties of producing a lexicon of technical terms made for an uneasy quest for lexicographic authority. The standards of authority these 'non-scientific' actors tried to hold themselves up to demanded that the needs of the Hindi learner converge with the expectations of coherence required by the form of the modern glossary. The multiple stages, multilingual resonance and play of publics in the Sabha's lexicography became, in the final form of the glossary, a bare list. In the methodically produced modern lists of the *HSG*, the authority of science was rendered mostly through the authority of Sanskrit neologisms. A Sanskritized, neologistic attitude to science translation and the assimilation of new knowledge more generally, manifest in the afterlives of the glossary genre, became a defining technology of language-rule in postcolonial India.[110]

Notes

1. King, *One Language, Two Scripts*; Orsini, *Hindi Public Sphere*; Mody, *Making of Modern Hindi*; Rai, *Hindi Nationalism*; and Dalmia, *Nationalization of Hindu Traditions*.
2. Elshakry, "Knowledge in Motion," 703.
3. Mukharji, "Vernacularizing the Body," on agency and local specificity, see 556, 571, 584-5.
4. The disciplines covered included astronomy, chemistry, geography, mathematics, philosophy, physics, and political economy.
5. Cohn, "The Command of Language."
6. Dodson, "Translating Science"; and Pande, *Medicine, Race, and Liberalism*, 65-93.
7. Dodson, "Translating Science," 816-18.
8. Mitchell, *Language, Emotion, and Politics*, 10-11.
9. Orsini, "Between *Qasbas* and Cities"; Mitchell, "Parallel Languages, Parallel Cultures."
10. Hakala, *Negotiating Languages*, 12.
11. Ibid., 7; Dalmia, *Nationalization of Hindu Traditions*, 186-191.
12. Ibid., 25.
13. See Datla, "A Worldly Vernacular," for this invocation of modern science as knowledge locked up in English.
14. Das, *Hindi Sabdasagar*.
15. Das ed., *HSG*, xv.
16. In the *HSG*'s preface, Das himself recorded efforts to coin technical terms in Gujarati, Marathi and Bengali in the 1880s and 1890s. By the 1910s, Telugu technical terminology had come to the attention of the Andhra Sahitya Parishat; a Tamil Scientific Terms Society had been established; and Urdu terminologies began to be produced at Osmania University. See Reddy, "Andhra Sahitya Parishat," 287, 306; Ramaswamy, *Passions of the Tongue*, 198; and Datla, "A Worldly Vernacular."
17. A multilingual perspective rejects surprise at the mixing of languages, groups and geographies and resists the identification of a place with a single language or linguistic and religious group. See Orsini, "Between *Qasbas* and Cities," 69-70. See also the generative argument for 'multilingual epistemologies' and 'multilingual source reading' in Mitra, *Indian Sex Life*, 22.
18. Elshakry, "Knowledge in Motion," 704.
19. Gyan Prakash regards Mitra's scheme as an instance of the cultural appropriation of the discourse of science by a middle-class western-educated Hindu elite through translation, while Partha Chatterjee comments on the scheme's flexible nature and its contestatory ambition. Prakash, 'Science between the Lines,' 6; Prakash, *Another Reason*, 50-51; Chatterjee, 'Disciplines in Colonial Bengal,' 21-22.
20. Zastoupil and Moir ed., *Great Indian Education Debate*.
21. Windhausen, "The Vernaculars, 1835-1839."
22. McCully, *English Education*, 139.
23. Dodson, "Translating Science," 821-22.
24. Ibid., 822.
25. Ibid., 821, 829. These included terms for metals and other elements, such as '*loha*' for iron and '*gandhaka*' for sulphur.
26. Ibid., 821-822, 825-828.
27. Ibid., 829-830.
28. Pande, *Medicine, Race, and Liberalism*, 68.
29. Mukharji, *Nationalizing the Body*, 85, 87.
30. Breton, *A Vocabulary of the Names*. See also Pande's discussion of John Tytler, Breton's successor at the NMI who preferred to translate medical texts into Arabic; Pande, *Medicine, Race and Liberalism*, 77-80.
31. Mukharji, *Nationalizing the Body*.
32. For Mitra's biography and career in colonial archaeology, see Guha-Thakurta, *Monuments, Objects, Histories*, Chapter 3, and n3 on 322.
33. Mitra, *Scheme for Rendering*, 1.
34. Chatterjee, "Disciplines in Colonial Bengal," 21. On the rise of English as the language of global science by the mid-twentieth century, see Gordin, *Scientific Babel*.
35. Mitra refers to Urdu as Hindustani throughout his text.
36. Mitra, *Scheme for Rendering*, 4.
37. Ibid., 15.
38. Ibid., 14.
39. Ibid.
40. Ibid., 16-17.
41. Ibid., 17-19.
42. Ibid., 19, 21.

43. Although no comprehensive survey currently exists of the full range of scientific and medical publishing in English or the vernaculars, these sources have been used extensively in several recent works. For some examples, see Mukharji, *Nationalizing the Body*, 75-110 and Das, *Vernacular Medicine in Colonial India* for Bengali medical publications; Sharma, *Indigenous and Western Medicine in Colonial India* and Attewell, *Refiguring Unani Tibb* for Hindi and Urdu medical publications; Savary, *Evolution, Race and Public Spheres* for Hindi and Urdu discussions of race concepts.
44. Mukharji, *Nationalizing the Body*, 189-90.
45. Das ed., *HSG*, vii.
46. Mitchell, *Language, Emotion and Politics*.
47. In the following decades, such literary associations (called *anjuman, sahitya sabha, mandal* and *parishad*), led by privileged-caste middle-class Indian male elites emerged across the subcontinent to promote regional literary spheres. They were self-consciously modelled as alternative spaces to the colonial governance of language, literature and education initiated in the previous century. See also Deshpande, "Shuddhalekhan," 77.
48. Mitchell, *Language, Emotions and Politics*, 160.
49. Mitra, *Scheme for Rendering*, 19.
50. Das ed., HSG, xv.
51. Ibid., v-vi.
52. Reddy, "Andhra Sahitya Parishat," 287.
53. See note 4 above.
54. Das ed., *HSG*, i-xx.
55. Dodson, "Translating Science," 831.
56. Ibid., 822 for the colonial consensus that Europeans were better equipped for "'drawing out" out the linguistic resources of the vernaculars' for the task of translating science.
57. Extract from the third annual report of the Kala Bhavan, Baroda, for the year 1892-93, quoted in Das ed., *HSG*, v-vi.
58. See Dodson, *Orientalism, Empire, and National Culture* for an astute analysis of the colonial-era transformation of the cultural role, intellectual practice and self-understanding of pandits trained at the Benares Sanskrit College.
59. Sudhakar was also sought out by prominent European philologists such as George Thibaut and George Grierson for his philological expertise.
60. Mahavir Prasad's editorial authority extended far beyond the periodical, and in Hindi literary history, the first two decades of the twentieth century are named after him. On Dwivedi as the arbiter of Hindi literary authority, see Mody, *Making of Modern Hindi*. For an excellent overview of literary developments and major figures in this period, see Trivedi, 'Progress of Hindi, Part 2.'
61. Das ed., *HSG*, viii.
62. *Hindi Scientific Glossary, No. 2*, 1.
63. Das ed., *HSG*, xii.
64. Ibid., xi-xii.
65. Mitra, *Scheme for Rendering*, 2.
66. Ranade ed., *Twentieth Century English-Marathi Dictionary*. The work was brought out between 1903 and 1916 in 16 volumes.
67. Das ed., *HSG*, x.
68. Ibid., x.
69. Ibid. Further research is required to assess how many words from other vernaculars were eventually selected in the *HSG*.
70. Ibid., vii.
71. On the 'coevalness' of north India with Calcutta, and an approach which narrates their connected literary and intellectual histories without metaphors of lag, 'delay' and 'catching up', see Orsini, 'Between *Qasbas* and Cities,' 69-70.
72. See note 48 above.
73. Along with the chemical terminology discussed in this section, tentative terminologies also survive for these four disciplines and are available at the British Library, London.
74. Only the terminologies for philosophy and chemistry included a preface. For example, Mahavir Prasad Dwivedi explained his reasons for including Sanskrit terms related to the Six Systems of Indian Philosophy in his terminology. *Hindi Scientific Glossary, No. 5*, i.
75. *Hindi Scientific Glossary, No. 2 Chemical Terminology*.
76. Bensaude-Vincent, 'Introductory Essay,' quote on 10.
77. Gordin, *Scientific Babel*, 21. The reform of chemical nomenclature in European languages was debated throughout the nineteenth century, and stabilized only gradually through international meetings and organizations such as the Geneva Conference (1892) and the International Union of Pure and Applied Chemistry (1919).

78. Ballantyne, *Discourse on Translation*, 16.
79. Mitra, *Scheme for Rendering*, 7-8.
80. *ibid*., 20. Mitra quoted approvingly from a textbook authored by the British chemist William Allen Miller, that 'the object of the inventors of chemical names is not merely to give a distinguishing name to the substances spoken of, but also to their components and even of the proportions in which those components occur.'
81. *Hindi Scientific Glossary, No. 2*, 1.
82. Ibid., 1, 5, 6.
83. Ibid., 6.
84. Ibid., 5-6.
85. Ibid., 6. Ballantyne had translated Phosphorous as '*prakāśada*' (the giver of light), an equivalent once again ignored by Prasad.
86. Ibid., 2.
87. Ibid., 5.
88. Ibid., 5, 7.
89. On the status of such parachemical knowledge in the colonial episteme and its performative politics, see Mukharji, "Parachemistries."
90. Ibid., 1. Prasad also referred to the Sanskrit *materia medica* in seeking apt equivalents for the terms 'acid' and 'base', which he translated as '*dravaka*' and '*kṣāra*' respectively; Ibid., 17.
91. Das ed., *HSG*, 95-99.
92. Mitra, *Scheme for Rendering*, 21.
93. Das ed., *HSG*, 153.
94. Ibid., 151-2.
95. Ibid., 153.
96. Ibid., xiv-xvi for details of the revision committees and the process followed for each discipline.
97. Ibid., 117.
98. Reardon-Anderson, *Study of Change*, 41. *Huaxue cailiao Zhong-Xi mingmingbiao* [A Chinese-English Vocabulary of the Names of Chemical Substances] contained five thousand terms, many of which continue to be in use with modifications, according to Reardon-Anderson.
99. Elshakry, "Knowledge in Motion," 711-712.
100. See note 15 above.
101. Mathur, "*Hindī aura vaijñānika paribhāsā*' [Hindi Scientific Terms]," 49-50.
102. I study the emergence of *Vigyan* in the Hindi literary landscape in detail in Singh, 'Science, Hindi Print and Agricultural Improvement,' 58-99. For the narrative strategies used to bring instrument-based experimental practices into the imaginary of Hindi readers, see Singh, "Shastri and the Air-Pump."
103. Many of the writers and science graduates who wrote in *Vigyan* used the *HSG* and also commented upon its limits. In light of these criticisms and public discussions of terminology, the Sabha revised the lists for astronomy, chemistry, mathematics and physics with the help of Indian science professors at the Benares Hindu University (1918). When these revised lists were published between 1929 and 1934, the Sabha declared that it aimed to create 'a common Scientific Vocabulary for the whole of India,' echoing the partisan assertion that Hindi was the only vernacular fit to become a national language. Sethi, *Hindi Scientific Glossary: Physics*; Varma, *Hindi Scientific Glossary: Chemistry*; Sethi, *Hindi Scientific Glossary: Mathematics*; Pande, *Hindi Scientific Glossary: Astronomy*.
104. Reardon-Anderson, *The Study of Change*, 15-16.
105. Bensaude-Vincent, "Introductory Essay."
106. Annual subscriptions to *Current Science* and *Vigyan* cost six rupees and three rupees, respectively. I analyse these English journals with respect to *Vigyan* and their different readerships in Singh, 'Science, Hindi Print and Agricultural Improvement,' 194-197.
107. Chatterjee, "Disciplines in Colonial Bengal," 17.
108. Lisa Mitchell points out that at least 43 different languages are used as media of instruction in Indian schools. Mitchell, *Language, Emotion and Politics*, 14. Some vernaculars, such as New Kannada, also served as languages of science in premodern South Asia, despite the presumed hegemony of Sanskrit. See Gurevitch, "The Uses of Useful Knowledge"; and Pollock, "The Languages of Science."
109. Mukharji, "Vernacularizing the Body," 556.
110. In 1960, the Indian government established a Council for Scientific and Technical Terminology (CSTT) with the aim to develop technical terminology in all Indian languages. The CSTT has continued to produce glossaries of administrative terms for different state departments and glossaries for particular scientific disciplines. http://www.csttpublication.mhrd.gov.in/english/overview.php (Accessed on 2 September 2020, 8.30pm).

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