

Epistemology of Color

Knowledge structures in the dye industry of
Colonial India

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Introduction

What is knowledge? It is a question philosophers have been trying to answer for millennia. The history of science seeks to answer a similar question. How is knowledge developed and how do societies throughout time and space define science? European scientists and historians have come up with very specific guidelines for how scientific knowledge is defined, but knowledge has existed in many forms, and we are only just beginning to investigate alternative, non-written forms of knowledge. One industry that provides a very interesting cross section between science, traditional, and practical knowledge, is dye, especially natural vegetable dyes. For the entirety of Indian civilization, the people of the Asian subcontinent have been known for their fabulously dyed cloth. As the native home of the indigo plant, India has long been involved in the domestic and international textile trade. When the British established a colony in India, they introduced new knowledge structures to the dye industry. In pre-colonial India, the dye industry was extremely regionally specific and dye knowledge was generated through family and village networks and transmitted through the practice of the craft. When British naturalists and botanists came to India, they sought to catalog information in writing, for the purpose of finding a universal indigo processing method. These knowledge structures were different both in their transmission and their goals. The native Indian strategy for dye knowledge was transmitted orally and practically and was highly specific and localized in nature. The British sought empirical knowledge that could be recorded in writing for the purposes of collecting, storing, and comparing. Knowledge in the dye industry transitioned from generational craft to empirical science with the invasion of British colonialists.

Historiography

The textile industry of India has been the focus of many histories, from the earliest times through to the modern era. India had been known for its incredible textiles for centuries and that has prompted a lot of study into the industry itself. However, given that the textile industry is such a wide-ranging field, when one goes to narrow the search to dye information in the colonial era, the main topic that appears is indigo production. Prakash Kumar has written numerous works on knowledge transmission within the colonial indigo industry, and others like Padmini Tolat Balaram have written about the longer history of Indian Indigo. However, there are very few who write about the pre-colonial dye industry or about knowledge production within the textile industry. There are also very few historians who focus on knowledge within the economic industries.

Generational, familial, and caste knowledge is often only addressed in an abstract or purely social context. The book *Castes of Mind* by Nicholas Dirks, examines the constructions of social hierarchy within the colonial setting and explores how British imperialists reconstructed the idea of caste as a social phenomenon that did not exist in the same way in the medieval period. This work does not address industry but does address knowledge formation. Historians of science often focus on empirical knowledge rather than craft and familial knowledge, and gender and network historians focus on knowledge in an abstract sense or as craft (such as spinning and embroidery) rather than in the more scientific context of dye. Essentially, traditional scientific knowledge systems are not well studied in Indian history, partially because there are few non-colonial sources. As these knowledge systems were based on oral tradition and practical teachings rather than written work, it is more difficult to identify and communicate the role of that knowledge.

The few primary sources relating to the dye industry are accounts from various British explorers and naturalists. A major horticulturist and dye enthusiast was William Roxborough. There are several monographs by Roxborough that are applicable to this topic including: *Plants of the coast of Coromandel, 1795*, and *Flora Indica: or Description of Indian plants*, originally published in 1832. Another British naturalist and recorder who wrote about dye is Benjamin Heyne who published “Tracts, Historical and Statistical, on India: With Journals of Several Tours through Various Parts of the Peninsula: Also, an Account of Sumatra, in a Series of Letters” in 1814 as well as an essay on the process for dyeing red cotton yarn in Southern India. These archives are useful to see how the British tried to interpret non-written knowledge and because the monographs on the dye industry were written by naturalists who were primarily interested in describing plants and how they were used. Though the texts were used by the colonial government to figure out how to profit from and rule India effectively, the content of the works are primarily concerned with describing processes as accurately as possible.

This essay aims to explore the production and transmission of knowledge in the Indian dye industry during the colonial period. By providing a contrast between medieval and early colonial dye methods and the later British imperial perspectives, I hope to illustrate the fluidity of knowledge structures within this industry.

Pre-Colonial Dye Industry

India has been known for its dyes for millennia, especially for Indigo. There have been pieces of cloth dyed with indigo, likely from India, found at ancient Greek and Egyptian archeological sites: “At about 4,000 BCE India had begun exporting dyestuffs to the countries called

the cradle of Western Civilization.”¹ Indigo was exported both as pre-dyed textiles and as indigo cakes, “which was made by extracting the dye from the plant. Hence it was more concentrated and pure, and the cakes could be preserved for many years.”² Although the indigo dye was used outside of India, primarily to dye black fabric, the knowledge of how to ferment and extract the dyestuff from the indigo leaves was not known elsewhere.³ The Indian dye industry also produced extraordinarily beautiful and complex patterns and colors throughout the pre-colonial eras. Dyed textiles were mentioned in the Dharmasutras, a law code book which contained guidelines for the types of clothes social classes should have worn.⁴ These laws and customs restricted the use of different colors and dye pigments for various classes. For example, “a *brahman*’s garment should be white and unblemished, a *ksatriya*’s dyed madder red and a *vaiśya*’s yellow silk. Or else, people of all classes may wear un-dyed cotton garments.”⁵ While these laws were not followed ubiquitously nor continuously throughout Indian history, the mentions of specific dyes and colors show the importance of colored cloth in Indian society. In fact, “all types of patterned textiles evoked admiration and awe in the writings of Sanskrit philosophers who were intrigued by cloth that had been dyed, patterned or woven in more than one color.”⁶ Although we do not have many good sources for the processes used by the dyers and weavers to create textiles, we can see through

¹ Padmini T. Balaram, "Indian Indigo," in *The Materiality of Color: The production, Circulation, and Application of Dyes and Pigments, 1400-1800*, ed. Andrea Feeser, Maureen Daly Goggin, and Beth Fowkes Tobin, (Surrey, England: Ashgate Publishing Limited, 2012), 142.

² Ibid., 141.

³ Ibid., 142.

⁴ Himanshu P. Ray. “Warp and Weft: Producing, Trading and Consuming Indian Textiles Across the Seas (First–Thirteenth Centuries CE),” in *Textile Trades, Consumer Cultures, and the Material Worlds of the Indian Ocean: An Ocean of Cloth*, ed. Pedro Machado, Sarah Fee, Gwyn Campbell, (Palgrave Macmillan, Cham, 2018), 295.

⁵ Ibid.

⁶ Ibid., 297.

ancient written sources and preserved textile fragments that the dye industry was well established and complex for centuries before the British colonization.

The dye industry interacted with the larger textile industry at many points throughout the creation of a garment. Yarn was dyed before weaving and used with other colors to create patterns, cloth was dyed one uniform color once woven, and cloth was painted and printed in complex designs using many different methods and colors. In all aspects of textile production great skill was required; a British account of the cotton manufacture at Dacca noted the “great diversity – natural aptitude, hereditary instruction, and constant practice” that allowed spinners and weavers “to attain to different degrees of excellence in the art.”⁷ There was a similar diversity of talent for dyers and, though dyed fabrics were produced all over India, the “northern region was the centre of production of a small, high value, high quality painted cloth much in demand in the royal courts of Persia and Delhi in the first half of the 17th century.”⁸ This essay will focus more on the uniform dyeing of textiles and the production of indigo dyestuffs rather than painted or printed cloth, but it is important to note the diversity of the industry and the individual skill needed to produce the finest textiles.

Familial, Village, and Caste Knowledge

The dye industry of early colonial India was based on incredibly specific recipes. On one account, simply preparing the cloth to be dyed (a process called mordanting) took weeks of constant soaking, drying, and boiling the cloth in various chemically astringent solutions. If the intended color of the cloth needed to be more intense, “a second mordanting was also done, and all these

⁷ James Taylor. *Descriptive and Historical Account of the Cotton Manufacture of Dacca* (London, 1851), 38.

⁸ Kanakalatha Mukund. "Indian Textile Industry in 17th and 18th Centuries: Structure, Organisation and Responses." *Economic and Political Weekly* 27, no. 38 (1992), 2059.

preliminary stages took more than a month. If the yarn could be stored for another month before the chayroot application, the colour would be much superior.”⁹ The actual application of the dyes was a similarly complex and time intensive process. Knowledge and attention to detail were crucial to the entire process and could only have been formed over generations of experience.¹⁰ The dye knowledge was based on oral tradition and teaching between familial generations of dyers. As none of this process was written, and much of the knowledge was based on perception and evaluation, any break in this chain of curated knowledge would mean a total loss of that information. As the dye process was so intensive, the entire family would be involved. In a certain technique of resist dyeing, “knots ('khunti') tied with string according to a pattern drawn on the cloth form the resist, blocking out the small circles not to be dyed.”¹¹ It is mentioned that this process is specifically done by women. Even if women were not mentioned in the colonial accounts of the dye process, the dyers often worked on their own land near their homes. During this period “household labour dominated the agricultural sphere and wage labour the agro-industrial sphere. Some households participated in both but for most there was a clear distinction.”¹² There is an assumption that when a household is mentioned all members of the household participated. Unlike European conceptions of industry, the dye work was not done in removed factories; the entire multi-generational family would have been in relatively close proximity to the dye work.

One of the major factors in knowledge production in the dye industry was location. The subcontinent of India contains numerous biomes and regions. Dye techniques varied because of the available raw materials “since the quality of the dyeing depended not merely on the dyes used, but

⁹ Mukund, “Indian Textile Industry,” 2059.

¹⁰ Ibid.

¹¹ Ibid., 2060.

¹² Willem van Schendel. "What is Agrarian Labour? Contrasting Indigo Production in Colonial India and Indonesia." *International Review of Social History* 60, no. 1 (04, 2015).

on other factors, especially the mineral properties of the water.”¹³ Different regions grew different types of dye plants, from madder, to indigo, chayroot, and as each dye was based on raw vegetable material, there was a limited area to which the plant matter could be transported without losing viability, before it was processed either into a stable concentrated form, like Indigo cakes, or used in the process of dyeing cloth. Because of the specificity of materials, dye methods developed with extreme regional specificity. Even if the same dye matter was used, local water chemistry and weather produced variety in color.¹⁴ The regional differences produced dye recipes that were unique to each village and family. Some dye knowledge could have been transported with traveling artisans, but the nature of the recipes themselves necessitated sedentary dye knowledge.

Knowledge production was also impacted by the interaction between chemical technology and the structure of the village in rural India. When colonial agents came to India and began to study the political and social structure, “virtually all colonial commentators were impressed by the integrity, and relative autonomy, of the village.”¹⁵ There were larger kingdoms in pre-colonial India, but as most of the population was rural, the relatively small groupings of people were prime units of social organization and knowledge transmission. Villages were significant “for everything from political economy to cultural activities and identities, as were hamlets, even units identified as “streets” within villages.”¹⁶ Identity and social hierarchy was often constructed based on the village rather than on the larger kingdom.¹⁷ This phenomenon was influential to the dye industry because there were often entire villages involved in the many step process of dyeing cloth. Because the dye

¹³ Mukund, “Indian Textile Industry,” 2059.

¹⁴ Ibid.

¹⁵ Nicholas B. Dirks, *Castes of Mind: Colonialism and the Making of Modern India* (Princeton: Princeton University Press, 2001), 29.

¹⁶ Ibid., 74.

¹⁷ Ibid., 54.

process was so laborious and time intensive, individual families of dyers relied on the social support of the village. Thus, the local specificity of knowledge was based both on the physical location of the dyers and on their location in relationship to their village.

Caste is a uniquely Indian phenomenon that also relates to the sharing of information in the dye industry. What we know of as caste today is mostly a creation of the British who transformed it from a fluid, social hierarchy to a “distinctly religious system” that “enabled colonial procedures of rule through the characterization of India as essentially a place of spiritual harmony and liberation.”¹⁸ Although caste was not all-consuming in pre-colonial India, there is some evidence that caste structures played into local industry. For example, there were village castes that arose out of occupational groups such as “washers, blacksmiths, barbers, and carpenters” who performed services for “dominant, landed families for a yearly share of the village harvest.”¹⁹ The village would not have had more than a few of these families, which is different from other agricultural castes, but illustrates how family, caste, and occupation are all constructed together. In terms of the textile industry, a British account mentions how caste distinctions were becoming less relevant for weavers as “various classes of Sudras, as those of the castes of goldsmiths, barbers, betel-leaf sellers, and dealers in salt and oil, all engaged in the business of weaving.”²⁰ Again, while this is not specifically related to dye, the fluidity in caste membership should be observed. Caste was still an important grouping for knowledge transmission because the social pressure to maintain family groupings within caste meant that knowledge could be passed through generations and shared amongst caste members. The focus on the community rather than the individual meant that the dye recipes stayed local and were able to develop within those relatively closed units. Also, because caste was specific to

¹⁸ Dirks, *Castes of Mind* 12.

¹⁹ Ibid., 76.

²⁰ Taylor, *Account of the Cotton Manufacture of Dacca*, 74.

profession, the organizational system allowed each task within the textile process to be undertaken by a different sub-group of people.²¹ This system, where people did not need to know every step of the industry, allowed each individual process to be perfected. Many generations of craftspeople worked on a single problem and created dye recipes that were extremely complex and high quality.

The social, political, and economic organization of India during the pre-colonial era influenced the production of dye knowledge. Instead of dye processes being universal and well-known, they remained localized and influenced by specific regional factors. Caste and family structure meant that information was perfected over many generations through performance of method and oral transmission rather than written means.

Comparison of British Knowledge Systems

Through the writings of British naturalists and colonial informants about the dye and textile industries, it is clear they valued fundamentally different knowledge systems than the Indian artisans. The primary difference is the idea of written knowledge. The very fact that there are no pre-colonial Indian sources that document the processes of dyeing shows how that knowledge existed in an industrial and artisanal context rather than as a public resource. The sources that do attempt to codify this knowledge are the British naturalists who tried to gather all the useful knowledge of the industry. Some have argued that the interest of the British writers in practical knowledge are a result of a voracious textile industry in Britain that attempted to replicate the world's best textile production methods through mechanized rather than manual labor.²² The primary goal of most of the British expeditions was to transmit knowledge about the land which they hoped to conquer. The

²¹ Mukund, "Indian Textile Industry," 2059.

²² Maxine Berg, "Useful Knowledge, 'Industrial Enlightenment', and the Place of India." *Journal of Global History* 8, no. 1 (2013).

naturalists transformed “tacitly known and widely practised craft into concrete knowledge” and “committed experiences circulating in the indigo world, those resting with ‘old hands’ and ‘native’ customs, into tangible, described knowledge.”²³ The British texts also show how the Europeans viewed ‘useful knowledge.’ With these reports, the knowledge they codified was added to the body of printed works and empirical scientific knowledge.

Western scientific trends valued information about technologies and skills for the purpose of comparing and revealing the ‘best’ way to do something. William Roxburgh, one of the premier botanists and writers for the empire on dye plants and processes, “was wedded to the idea of ‘universalizing’ the new method of indigo manufacturing.”²⁴ Roxburgh, like many European scientists, wanted to find the single best way of processing and using the dye plants for the entire world. This is a stark contrast to the pre-colonial Indian methods which were extremely localized. Although the knowledge may have been less ‘formalized’ in the rural dyeworks, it was still highly technical and adaptive to the specific environment in which the dyers lived.²⁵ The European accounts give “insight into eighteenth-century investigations of ‘tacit’ knowledge in a distant part of the world, and attempts to ‘codify’ these.”²⁶ Dye knowledge, specifically for indigo, was valuable to the British only as “formal, discipline-based, and laboratory-edified” information, rather than generational craft based knowledge.²⁷ Some historians, especially European historians of science, see this pursuit of codified, written knowledge as “an ‘enlightened’ framework of enquiry, a gathering of

²³ Prakash Kumar, “Planters and Naturalists: Transnational Knowledge on Colonial Indigo Plantations in South Asia.” *Modern Asian Studies* 48, no. 3 (2014).

²⁴ Ibid.

²⁵ Tirthankar Roy. “Out of Tradition: Master Artisans and Economic Change in Colonial India.” *The Journal of Asian Studies* 66, no. 4 (2007).

²⁶ Berg, “Useful knowledge”.

²⁷ Prakash Kumar, *Indigo Plantations and Science in Colonial India*. (New York: Cambridge University Press, 2012), 8.

‘useful knowledge’, and an informed curiosity in wider-world resources, technologies, and skills.”²⁸

While the naturalists’ reports are certainly useful to historians because of their written and printed nature, it is important to note that the pursuit of this universal knowledge is not better or worse than localized practical knowledge frameworks. It has simply been preserved in a way that lends itself more easily to the historian’s process. It is also important to recognize that dye knowledge is both “information associated with a technical process... [and] ‘colonial knowledge’ as variously interpreted in the existing social histories of South Asia, that is, a social form embedded within colonial relations.”²⁹ Knowledge of dye practices has taken many different forms throughout Indian history, but because of the colonized nature of the Indian subcontinent, colonial records were valued and preserved over native knowledge.

Conclusion

No form of knowledge should be inherently valued over another. They are simply different methods of storing information and used for different purposes. The Indian craft knowledge was not written or codified but practiced to create the most vibrant textiles with the materials available in a specific location. Written British sources were concerned with recording dye processes for comparison and possible use in industry, and for the abstract value of holding information in an archive. For historians, it is difficult to explain native craft knowledge because it is stored in the minds and bodies of individuals. It is still valuable to study different forms of knowledge despite the challenge of finding a written archive of sources. Modern academia is primarily concerned with written and recorded knowledge, but for many millennia, most knowledge was not accumulated and

²⁸ Berg, “Useful knowledge”.

²⁹ Kumar, *Indigo Plantations and Science*, 9.

stored, but used in practice. This is true across civilizations but can be specifically examined for the dye industry of pre-colonial and early colonial India.

Dye is a useful and interesting case study because it requires practical and chemical knowledge. For other parts of the textile industry, such as spinning and weaving, intense practical knowledge was required, but the dye industry also requires an understanding of the dye plants and chemical makeup of mordants. Even though it was not called chemistry by the native artisans, the inherently scientific nature of dye bridges the gap between what Europeans categorized as science and craft. By seeing how those two apparently separate ideas combine into a single industry, we can begin to deconstruct our own conceptions of academic discipline and epistemology in the modern era.

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