Introduction

The Odyssey of Indigo

Indigo was the quintessential blue dye in the era when dyes were extracted from plants and minerals. The world, it seemed, had been extracting dye from the indigo plant forever. Knowledge of indigo as a source of blue dye would have been widespread wherever the plant grew. After all, the leaves of indigo yielded the color in small quantities on mere pressing or squeezing. In those times deep in history when the knowledge of indigo culture had not become specialized or attached to large-scale production for commerce, indigo dye's prevalence to a large extent was determined by climate. Indigo was fundamentally a plant of the Tropics that could not be grown in temperate climates. Europeans mostly drew their supply of blue dye from another plant of a related family, woad. A good amount of indigo was also obtained from the Orient even though the difficulty of transportation over long, land-based routes drove up its price and curbed its full-scale use in the West. It is known that Oriental indigo was available in ancient Egypt and in the Greco-Roman world going back to the second millennium B.C. The oldest global networks of indigo production had significant ties to the Indian subcontinent even though it is hard to specify those connections precisely.[1] The use of indigo rose in

[1] The Indian subcontinent was central to the early history of indigo. Scholars have commonly inferred that indigo was in use in India in the protohistoric city of Mohenjodaro in the second millennium B.C. Etymological evidence connects indigo's deep history with India. Jenny Balfour-Paul has given an account of indigo's history in the ancient and medieval periods. She wrote, "The last two millennia of indigo's economic history are neatly encapsulated in its names." The word "indigo" derives from the Greek *indikon* or Latinized *indicum*, which meant a substance from India. In addition, the Sanskrit word *nila*, or deep blue, spread from India to both Southeast Asia and the Near East and from the latter through Arab Muslim merchants to northern Africa and Spain and Portugal and lies at

the medieval period though monarchical states in Europe enforced a ban on its import in an attempt to shore up the local woad industry, and the centrality of Asia and the Indian subcontinent as a source of the blue dye continued.[2] The European blockade of indigo ended at the cusp of the modern era. The new Europe in the age of commercial revolution began to procure indigo from Asia in vast quantities as the emerging trading companies improved the connectivity of Europe with Asia and brought down the price of imported indigo. As a consequence, plant indigo was able to defeat woad on its own terrain in the West and emerged as the universal blue colorant of the modern world.[3]

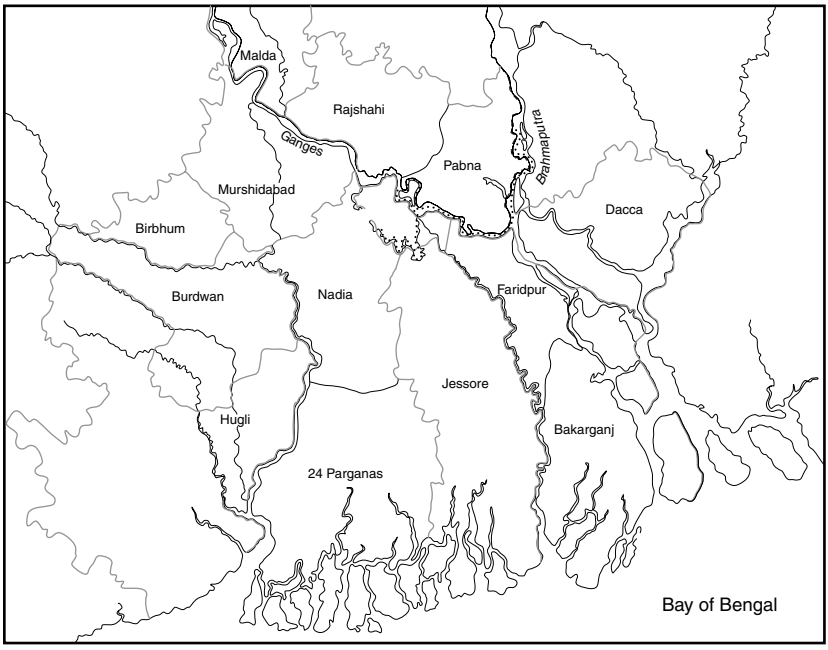
The history of indigo entered a new phase with the emergence of plantations in the seventeenth century. The plantations involved large-scale cultivation of indigo, managerial supervision by European planters, and the use of servile labor in various forms. The plantation life of indigo started in the Caribbean, South and Central America, and the American South, where modernizing trends in its production were apace before their appearance in South Asia. From the mid- to the late seventeenth century, the West Indian colonies, both English and French, and the Spanish controlled parts of Central America came to be the major suppliers of indigo to Europe. As English colonies in the Caribbean moved to the cultivation of other products, British imperial trade interests ensured the onset of indigo cultivation elsewhere within the empire. Indigo plantations first arose in South Carolina in the last three decades of the seventeenth century. But Carolina indigo could not meet the needs of the home market in Britain. It was also of an inferior quality compared to varieties emerging from Spanish Guatemala or the French Saint Domingue. A century later, the English East India Company officials based at Surat and Cambay were still trying to introduce indigo manufacturing in the presidencies of Madras and Bombay. But such efforts proved to be nonstarters.[4] Similar efforts, however, to shepherd the birth of indigo plantations in Bengal

the root of the Iberian word *anil* for indigo. Jenny Balfour-Paul, *Indigo,* London: British Museum Press, 1998; see chapters 2 and 3, pp. 11–88, quote on p. 11.

[2] Jenny Balfour-Paul, *Indigo,* London: British Museum Press, 1998.

[3] For the contest between woad and indigo in seventeenth-century Europe, see, Gosta Sandberg, *Indigo Textiles: Technique and History,* Asheville, N.C.: Lark Books, 1989, pp. 24–43.

[4] As Ghulam Nadri has recently pointed out, English officials made concerted efforts to poach on the surviving techniques of indigo culture in Gujarat, still an important manufacturer region, in order to start indigo production elsewhere on the subcontinent. Ghulam Nadri, *Eighteenth-Century Gujarat: The Dynamics of Its Political Economy, 1750–1800,* Leiden and Boston: Brill, 2009, p. 133; also see, notes 23 and 24.



MAP 1. Indigo manufacturing districts in Bengal in the early nineteenth century

by company officials in the last quarter of the eighteenth century proved magnificently successful. European planters, speculators, bankers, and traders responded positively to the encouragement given by the colonial state. After initial fits and starts, the plantations in Bengal began to expand at a feverish pace. At the beginning of the nineteenth century, Bengal had emerged as the predominant supplier of indigo to the world. The indigo plantations were mainly concentrated in the Lower Bengal districts as shown in Map 1.

This book is a story of indigo based on a case study of plantations in colonial Bengal.[5] The Bengal plantations had a lineage extending back to

[5] The dominant period of indigo plantations lasted from roughly the mid-seventeenth century to the end of the nineteenth century. In this age, plant indigo ruled the world of dyes. The use of indigo for dyeing and printing in blue was practically universal in this period. While there were a few minor blue dyes made from other sources such as minerals the currency of such blues was minor. Augusti Nieto-Galan, *Colouring Textiles: A History of Natural Dyestuffs in Industrial Europe,* Boston: Kluwer Academic Publishers, 2001, pp. 17–19. Also, the color shellfish purple was obtained from shellfish in the Roman and Byzantine Empires. But no reference is found to its use after the mid-fifteenth century. *Cf.* Jenny Balfour-Paul, *Indigo,* London: British Museum Press, 1998, pp. 14–15.

the period of the early rise of indigo plantations in the Caribbean. For a century and a half Bengal indigo was the object of major efforts to give it a modern form driven by changes in the worlds of knowledge, science, and trade. The Bengal plantations also turned out to be the last major holdout against the expanding sway of synthetic indigo. They lasted long after all other indigo plantations had decayed in the face of competition from the synthetic substitute. In short, the indigo of Bengal was central to the history of indigo from the beginning to the end. Thus Bengal plantations offer a compelling case study for analyzing the early genealogy, nineteenth-century consolidation, and late nineteenth- and early twentieth-century crisis and demise of agricultural indigo.

This is also a history of Bengal indigo in a global dimension. The history of indigo was not constrained by developments in the colonial locality alone. Rather, at each stage, this history was imbricated with genealogies extending to the prior period on the subcontinent and, in parallel, to developments beyond the subcontinent. This bifurcated genealogy was apparent even at the moment of the launch of plantations in Bengal in the last quarter of the eighteenth century and has previously drawn the attention of historians. For example, the historian of indigo enterprise in Bengal, Blair B. Kling, tried to capture Bengal indigo's antecedents on the subcontinent, saying, "From the seventeenth to the twentieth centuries indigo was a fugitive among industries, wandering from Gujarat in western India to the West Indies and then back to Bengal in eastern India."[6] Indigo production evidently had a long history in India. The chroniclers of the sixteenth- and seventeenth-century Mughal court in India and travelers have attested to the high level of output of indigo on the Indian subcontinent. The early records of European trading companies also attest that a good part of India's indigo was shipped at first by Armenian merchants and then increasingly by the Portuguese, Dutch, and English traders to the West.[7] As Kling rightly implied, any history of Indian indigo that singularly focuses on the novelty of the indigo enterprise in colonial Bengal runs the risk of minimizing indigo's local lineages

[6] Blair B. Kling, *The Blue Mutiny: The Indigo Disturbances in Bengal, 1859–1862,* Philadelphia: University of Pennsylvania Press, 1966, p. 15.

[7] W. H. Moreland and P. Geyl (trans. and ed.), *Jahangir's India: The Remonstrantie of Francisco Pelsaert,* Delhi: Idarah-i-Adabiyat-i-Delli, 2009, pp. 10–18; Jean Baptiste Tavernier, *Travels in India by Jean-Baptiste Tavernier, Baron of Aubonne,* translated from the original French edition of 1676 by V. Ball, second edition, edited by William Crooke, 2 vols., London: Oxford University Press, 1925; see vol. 2, *Concerning Indigo*, on pp. 8–12.

on the subcontinent. Indigo was prevalent in many regions of India and may even have been cultivated, used, and imported into Bengal before Europeans launched their plantations.[8] This earlier system of indigo manufacturing on the subcontinent already contained the basic elements involved in the culture of indigo.[9] It is also possible to show lines of influence between the prior culture of indigo in India and the emergent modern plantations in the Western Hemisphere as well as in Bengal. But despite such continuity, the indigo in Bengal in the last quarter of the eighteenth century had clearly entered a new career. For one, it departed from all prior Indian indigo production systems in that colonial capital was its primary driver. Even more importantly, however – and this is critical in terms of the existing gaps in indigo historiography – any claims of continuity from premodern local roots on the Indian subcontinent overlook the major changes in techniques and knowledge of indigo culture that transpired in a transnational dimension over the seventeenth and the eighteenth century. It is in the knowledge dimension that the Bengal plantations make their best claim for novelty from the previous regimes of production.[10]

From the beginning of the nineteenth century colonial South Asia was the largest exporter of indigo and remained so for the rest of the century alongside Java in Southeast Asia, Guatemala in Central America, and a few other minor areas of production. One turning point occurred in the middle decades of the nineteenth century. A movement against

[8] See a discussion of this aspect in Indrajit Ray, *Bengal Industries and the British Industrial Revolution (1757–1857)*, London and New York: Routledge, 2010, p. 210.

[9] Iqtidar Alam Khan, "Pre-modern Indigo Vats of Bayana," *Journal of Islamic Environmental Design Research Center* (1986): 92–8; K. K. Tivedi, "Innovation and Change in Indigo Production in Bayana, Eastern Rajasthan," *Studies in History* 10 No. 1 n.s. (1994): 53–79, see, p. 68.

[10] The historiography of indigo production in colonial South Asia is rich. The violence of indigo manufacturing as a colonial enterprise and the exploitation of Bengal peasantry engaged in the cultivation of indigo have been well documented. But these studies typically do not examine the technical context of indigo plantations even as they participate in the critique that the colonial industry was based on "antiquated" technique and primarily geared to exploit the cheap labor of natives. Benoy Bhushan Chowdhury, *Growth of Commercial Agriculture in Bengal, 1757–1900*, Calcutta: India Studies, 1964, 80–124; especially see his summation on 123–4. A major critique of indigo manufacturing by Chowdhury is articulated around the fact that profits from the colonial enterprise were not plowed back into improving the industry and its workings, but rather repatriated to Britain. Jacques Pouchepadass, *Champaran and Gandhi: Planters, Peasants and Gandhian Politics*, Delhi: Oxford University Press, 1999; see, 49–58 for a description of manufacturing labor, 127–36 for his analysis of appropriation of surplus from the peasantry, and 65–6 for a summation of his critique of the primitive characteristic of cultivation and manufacturing.

planters between 1859 and 1862 wiped out the indigo industry from Lower Bengal, which was the geographical pivot of indigo manufacturing on the subcontinent. This movement, called "blue mutiny," reflected the anger of the indigo peasantry against the excesses of European planters. But the popular movement failed to banish the industry from Bengal. The center of gravity of the colonial indigo industry simply shifted elsewhere to north Bihar within the Bengal Presidency.

Meanwhile rumblings of a deeper change in the world of dyes that were slowly coming to the surface would determine the future of Bengal indigo. The plant-derived dye began to face the new reality of market competition from synthetic dyes that were extracted industrially from coal tar–based hydrocarbons. The synthetic dye industry had its birth in England and France in the middle decades of the nineteenth century. But as the century progressed, Germany took the lead in the industrial production of synthetic dyes. Most critical advances in dye science based on organic chemistry and innovations in dye manufacturing took place in Germany, which cornered much of the world's trade in synthetic dyes in the last quarter of the nineteenth century. Synthetic dyes were pure and generally cheaper than natural dyes. Many variants of synthetic dyes, the anilines and alizarins in particular, were made available to the users of natural indigo. But by and large these alternates only supplemented the supply of blue and in the context of increasing use of indigo worldwide never really displaced natural indigo from the market. The plant-derived indigo held its position against the early synthetic blues.[11]

The challenge from synthetics intensified, however, with the launching of synthetic indigo by the German company, Badische Anilin and Soda Fabrik (BASF), in 1897. Synthetic indigo progressively ate into natural indigo's erstwhile markets in the West as additional German companies and their subsidiaries also started producing the synthetic substitute. The planters in Bengal were now called upon to take measures to produce cheaper and purer agricultural dye in order to compete with synthetic

[11] There exist many histories of the rise of the synthetic dye industry based on the archives of synthetic dye companies in the West. These studies have predictably not focused on the longevity of natural dyes and the resistance offered by them. A singular focus on synthetic dyes in the histories of transition tends to "naturalize" the death of agricultural dyes and furnishes a somewhat triumphalist understanding of the rise of synthetic dyes. John J. Beer, *The Emergence of the German Dye Industry,* Urbana: University of Illinois Press, 1959; Anthony S. Travis, *The Rainbow Makers: The Origins of the Synthetic Dyestuffs Industry in Western Europe,* Bethlehem, Pa.: Lehigh University Press, 1993; Carsten Reinhardt and Anthony Travis, *Heinrich Caro and the Creation of Modern Chemical Industry,* Dordrecht: Kluwer, 2000.

indigo in the international market. The effort to improve natural indigo after the introduction of synthetic indigo was largely determined by the nature of competition from a consistent and cheaper industrial product. The planters embraced modern laboratory science in an effort to make the natural dye purer and to lower its cost of production. This program of improvement in the colony continued for more than two decades. It was finally stopped when trade losses produced a sense of hopelessness with regard to the prospect of revival of indigo plantations. By the closing years of the First World War synthetic indigo seemed to have won unequivocally in the market, and, as a result, scientific efforts to improve natural indigo in the colony ceased in 1920.

Analyzing the Knowledge of Indigo Culture: Historiographical Constraints

In following the odyssey of plant indigo this book's fundamental project lies in uncovering the various knowledge forms surrounding indigo. This knowledge existed in multiple forms, such as textual knowledge describing ideal methods of cultivation and processing, information passed along continents and circulating among indigo manufacturers, the awareness of optimal agricultural and environmental conditions, the epistemic component of techniques of indigo manufacturing in use, and the knowledge attached to the practice of indigo culture. At its functional end, this knowledge was geared toward improvement[12] of the indigo plant and the processes involved in indigo culture. Improvement from the planter's perspective meant increasing the yield of the crop in the field and growing better plants with a higher content of color. On the manufacturing side, improvement meant reducing the price of the commodity either by

[12] Slightly different studies of "improvement" as a societal goal or imperial project have appeared elsewhere. Joyce Chaplin, *An Anxious Pursuit: Agricultural Innovation and Modernity in the Lower South, 1730–1815,* Chapel Hill and London: University of North Carolina Press, 1993; see particularly pp. 23–65; David Arnold, *The Tropics and the Traveling Gaze,* Delhi: Permanent Black, 2005; see the stating of his position on improvement on p. 6; Richard Drayton, *Nature's Government: Science, Imperial Britain, and the "Improvement" of the World,* New Haven, Conn., and London: Yale University Press, 2000. The construct of improvement as a colonial project for changing Indian society appears frequently in South Asian historiography: "[Quite early on,] by the end of Lord Cornwallis's years as governor-general (1786–93), the British had put together a fundamental set of governing principles. For the most part these were drawn from their own society, and included the security of private property, the rule of law, and the idea of 'improvement.'" Thomas Metcalf, *The New Cambridge History of India: Ideologies of the Raj,* Cambridge: Cambridge University Press, 1995, p. 17.

cutting labor costs on factory processes or by making extraction efficient. The claims regarding knowledge of improvement had to be validated in the marketplace. The market players placed value on the dye produced in certain ways. The users accepted or rejected the claims of improvement. The knowledge of indigo culture was evidently created in different locations and spaces and validated in laboratories and far-off markets.

The methods of knowledge production evolved during the long history of indigo plantations. Flow and exchange of information across the planters' diasporas in the Atlantic system of the seventeenth and eighteenth centuries and the honing of skills and craft practices at the hands of planters and peasants laid the foundation of the indigo knowledge system. Useful information on indigo cultivation and manufacturing was committed to and codified in a few foundational texts, which were then translated and disseminated widely. Some of these important indigo texts found their way to Bengal on the Indian subcontinent and influenced planters' craft even as they were modified in a local context of application. Indigo itself had to adjust to local landscapes in Bengal – both physical and social. Local climate put a limit as to what type of knowledge could be actually put into practice in the cultivation and processing of indigo.

The rise of empiricist trends in modern science over the nineteenth century altered how the knowledge of indigo culture was generated. These changes undergirded the transformation of indigo knowledge from its earlier moorings in natural history and craft practices into the shape of a more formal, discipline-based, and laboratory-edified science in the second half of the nineteenth century. Toward the close of the nineteenth century these methods underwent further transformation as planters and the colonial state established laboratories and agricultural stations to alter plant indigo. The establishment of these institutions transpired in the shadow of the rise of agricultural stations as the predominant institution for applying principles of agricultural science to the practical task of improving productivity.[13]

[13] The more specific form of "experiment stations" rose in mid-nineteenth-century Germany and then later spread to other nations and continents. Margaret W. Rossiter, *The Emergence of Agricultural Science: Justus Liebig and the Americans, 1840–1880*, New Haven, Conn.: Yale University Press, 1975; it has been argued that England's premier agricultural research station at Rothamsted itself underwent reorganization in the model of continental experiment stations in the early twentieth century. For England's longer-term tradition of agricultural research, see, E. J. Russell, *A History of Agricultural Science in Great Britain, 1620–1954*, London: George Allen & Unwin, 1946.

This is a social history that focuses on the nature and circumstances of production of indigo knowledge. Seen one way, indigo knowledge was a body of information associated with a technical process. Seen another way, indigo knowledge was also "colonial knowledge" as variously interpreted in the existing social histories of South Asia, that is, a social form embedded within colonial relations. The tracks followed by the history of science and South Asian history are both indispensable for generating a complete understanding of the knowledge of indigo culture. The former helps uncover the constructed nature of the technical aspects of indigo culture. But a full recovery of the social dimension of indigo culture requires analysis of the larger context of colonial relations as studied in area study approaches in South Asian history. Indeed the book contends that the study of indigo knowledge requires a simultaneous consideration of textual knowledge, natural history, modern scientific practice, institutional dynamics, colonial relations, and the political economy of colonialism.

But the study of science in South Asian historiography has so far evolved along two parallel tracks – works that cover colonial science and works that cover the social history of science in colonial South Asia. Their respective philosophical orientations and theoretical borrowings have led them in different directions, and they have built their own respective momentums in isolation from one another. Thus South Asia historians who study "science" fall into one group or the other. The partiality in favor of analysis in one or the other framework also accounts for the apparent chasm that separates the study of science so far. This mutual obliviousness is unfortunate because each field has much to contribute to the other and even more so because, as this study argues, the gap between the two fields is not unbridgeable.

The field of colonial science in South Asia, while invested in analyzing broader questions of colonialism and modernity, has maintained a separate identity because of the agenda that the field has defined for itself. With its broad moorings within the classical history of science in the West and imperialism studies, the field has dwelled in a collection of issues around transfer and movement of knowledge, science as a tool of empire, and the nature of engagement between Western and native knowledge systems.[14] It is within this larger agenda that the field of colonial science approaches the "social."

[14] The history of science field delved into sociology of knowledge with a corresponding focus on the social context in a separate trajectory of its own. As Jan Golinski has

On the other hand, the social study of science in South Asian historiography has emerged out of traditions of investigating knowledge as a social form, evolving on two parallel tracks. Among the earlier generation of historians, Bernard Cohn used the trope of knowledge to investigate the social history of colonial India. Cohn argued that the initiatives ranging from revenue measures to the creation of Orientalist scholarship on India or the collection of historical artifacts from the Indian past were not benign but rather represented an effort to understand, codify, and rule India. Thus, in this rendering, India's castes and tribes or its museums or brahmanical religion, all were alibis for or stood for colonial knowledge.[15] Another important moment in the expanding use of knowledge frameworks was reached with the publication of Edward Said's *Orientalism* in 1978. Said addressed the knowledge implicit in Western texts as European representations of non-Western peoples. South Asianists combined Said's analysis with the new understandings of knowledge from the fields of postcolonial theory and literary theory to focus on discursive formations and on language as sites of knowledge formation. In particular, Michel Foucault's notion of discursive formations made a major impact with ideology, science, and social science theory – all of the latter, as "domains of objectivity" – becoming open

illustrated, postwar accounts of history of science opened up to inputs from the growing field of sociology of knowledge. The time was opportune because history of science was gradually moving out of the older tracks of documenting progress and the discovery of a preordained "nature" toward a more historicist project of contextualizing. In this new intellectual environment historians were ready to embrace an understanding of historical development of knowledge marked by "discontinuities and transformations" rather than mere "forward movements." But Golinski also pointed out a subsequent countermovement in the consideration of the social in the research program of the history of science. He argued that the rise of the constructivist program from the 1970s has caused a reduction in the scale of the "social" that is analyzed by historians of science. The targeted focus on specific episodes, controversies, and ethnographic look-in at the laboratory has caused a "trend away from macrosocial explanations." Jan Golinski, *Making Natural Knowledge: Constructivism and the History of Science,* Cambridge: Cambridge University Press, 1998, pp. 2–4, 10–11.

[15] Bernard Cohn's writings appeared in various publications from the 1950s to the 1980s and are published as two major collections: Bernard Cohn, *An Anthropologist among the Historians and Other Essays,* Delhi: Oxford University Press, 1990; *Colonialism and Its Forms of Knowledge: The British in India,* Princeton, N.J.: Princeton University Press, 1996. These understandings of social forms and things as knowledge were the result of Cohn's ties with the historicist traditions within American anthropology in which culture was the "common frontier" of anthropology and historiography. See "Introduction" by Ranajit Guha in Bernard Cohn, *An Anthropologist among the Historians and Other Essays,* pp. vii–xxvi, and "Foreword" by Ronald Inden in Bernard Cohn, *Colonialism and Its Forms of Knowledge,* pp. ix–xvii.