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Beyond Ice: Cooling through Cloth, Scent, and Hue in Eighteenth-Century South Asia

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In his dictionary of Persian words, written in Delhi around 1745, the writer and lexicographer Anand Ram Mukhlis pauses on the entry for *takhta-i yakh*, a word that means a “sheet of ice” (with *takhta* often referring to a flat plane, board, or surface and *yakh* meaning ice). Mukhlis notes that this ice is also called *parcha-i yakhi*, which translates literally to “cloth of ice,” although *parcha* can also mean a “piece” or “length.” He continues describing this ice as wide (*‘ariz*), long (*tawil*), and then uses a word, *shaffaf*, that can mean “transparent,” in the context of a garment, and “clear,” or “lustrous.” This ice, he writes, is “like the front of a mirror.”[1] In this entry for *takhta-i yakh*, Mukhlis evokes the texture and radiance of the material, likening this thin, wide sheet of ice to a diaphanous, gleaming cloth, and to the smoothness of a mirror. Mukhlis’s dictionary captures not just the meanings of words circulating in the Persian-speaking milieu of South Asia, but whole cultural worlds surrounding these terms.[2]

The description of the ice is followed by a poetic couplet from Mir Yahya Kashi, a seventeenth-century poet at the Mughal court, that describes how a frown on the lover’s face is so powerful that it melts a mirror as though it were a thin sheet of ice (*takhta-i yakh*). Then, he adds an associative anecdote (*naql*). Mukhlis recalls that when the Mughal Emperor Bahadur Shah (r. 1707–12) was in Lahore and went hunting in the early morning, he would find frozen water, and “his eyes sometimes would catch the cracks in sheets of ice. On this he used to wait and learn a moral.”[3] The diaphanous layer of frozen water at dawn had cracks that could teach even an emperor a lesson. On a broader level, the existence of this ice with the thinness of cloth and its shining mirror-like surface suggests that when encountering coldness and ice in eighteenth-century South Asia, Mukhlis and his contemporaries found in frozen water and frigid air an array of sensory metaphors and poetic associations that went beyond the coldness of the surface of ice.



More broadly, I propose in this essay that relief from the summer heat in eighteenth-century South Asia derived from materials and technologies that cooled not only through changes in temperature, but also through their imagery, their scent, their color, and their feeling on the skin. Written and visual evidence suggests that finding coolness in the hot months was a multisensory experience. This project looks beyond ice, which, like modern mechanical refrigeration and air conditioning, is typically a sensorily neutral, odorless, and colorless source of cold, towards diverse materials that shifted the thermal environment, including woven mats made of *khas* grass (vetiver) that were (and still are) doused with water to cool the atmosphere and release a refreshing scent, and silver-threaded bedsheets that brought respite from the heat during sleep.

For much of the year in the northern regions of the territory that the Mughal rulers knew as “Hindustan,” the experience of ice and cold was a luxury that only a few could access. The elite of the Mughal Empire (1526–1858), many of whom had connections to cooler climates in Iran and Central Asia, considered ice from the mountains, and grapes and melons from more temperate zones, as vital necessities for comfort and courtly enjoyment. Persian-language poetry circulating at the Mughal court lauded the refreshing temperature, pure water, crystalline air, and abundant fruits of summer retreats in Kashmir in the foothills of the Himalayan mountains.[4] During the long, dry, hot season, the imperial and regional architecture of northern Hindustan offered both passive and active cooling, including deep stepwells (*baoli*) and thick sandstone walls that absorbed daytime heat, keeping spaces cool inside. The tops of buildings were dotted with small domed *chhatris* to provide shade; pierced *jali* screens allowed air through but filtered the sun; bountiful fountains and waterways flowed in shaded gardens; and pipes carried water beneath palaces to cool the marble floors.[5] For those who could not requisition ice from afar, did not reside in marble palaces, or could not make the journey to Kashmir in the summer, grass mats and lightweight fabrics, alongside music, fruits, and paintings, conveyed refreshing abundance in the midst of the heat through texture, sight, taste, sound, and scent.

While the cold has historically been theorized as the privation of warmth and cessation of sensory pleasure, the evidence suggests that the arrival of coolness—from lowering the temperature of the air to soothe the skin or the movement of a breeze from a fan—could also be an experience of plenitude, comfort, and enjoyment in eighteenth-century Hindustan.[6] The Persian terms used for coldness and cooling convey the different associations of these thermal states. The word *sard*, which is the basic Persian word for “cold,” refers to a temperature or a state of being, such as a cold climate, but similarly to English, *sard* also carries emotional associations of a lack or loss of heat, passion, or even life. To become cold (*sard shudan*) also means to die, to become extinguished. A cold heart (*dil sard*) is one that is discouraged, whose spirits have been dampened.[7] The word *khunuk* (cool) is a more moderate form of coldness, and can be used to express a welcome relief in temperature.[8] For instance, *hawa-i khunuk* is fresh or temperate air. Although in contemporary uses, *khunuk* can mean boring or uninteresting, in the late nineteenth century, it was recorded that *khunuk* carried associations of cooling, comfort, but also happiness and good fortune.[9] The verb *khunuk kardan* suggested both “to render happy” and “to cool.”[10] Both *sard* and *khunuk* appear in period documents, often as near synonyms; for instance, within one paragraph in the Mughal *A'in-i Akbari*, the adjective *sard* is used to describe cold water, but when describing the cooling mats made of *khas*, the adjective *khunuk* conveys something “cooling” and refreshing. Though not systematically, I have used the terms “cold” and “coldness” (similar to *sard*) more frequently to refer to states of temperature

and have employed the term “cooling” (similar to *khunuk*) to capture the feelings of bodily comfort brought on by a change in weather or a refreshing scent.

Few objects remain, but the methods of cooling I discuss in this article were documented in texts and paintings primarily from sites in Rajasthan and the regions surrounding Delhi and Agra that experienced an arid hot season, rather than the humidity of tropical eastern Bengal or southern India. The focus on a variety of materials and sensory experiences is important for studying the question of cold or coolness. Heat and cold—the spectrum of the “thermal”—operate beyond the accepted five senses. As Boon Lay Ong proposes, the thermal has a sensory aesthetics of its own. [11] While coldness and heat are often associated solely with touch, the thermal encompasses phenomena beyond the tactile: the thermal sense communicates subtler, intangible information about fluctuations in air temperature, the presence of a refreshing breeze, or a heat transfer to or from the body. Lisa Heschong has argued in the context of architecture that pleasing experiences of thermal variation—what she terms “thermal delight”—can be brought into architectural design with the same subtlety as shifts in dappled light.[12]

However, the thermal also overlaps with and is enhanced by the other senses: as was theorized in parts of South Asia, and in the shared humoral medical theories that grew out of ancient Greek (Yunani) medicine, warmth or coldness emerge from distinctive physiological temperaments, and from flavors, fragrances, and cuisines. Evocations of coldness can be found in color palettes, perfumes, and textures, although determining these meanings must be approached with an attentiveness to context given that perceptions are not universally shared. Moreover, sensory experiences of the past and in different places are subjective and ephemeral and are impossible to reconstitute in full; what is left behind, as James McHugh writes in the context of his history of medieval scents, is often a poetic description or prescription for an “ideal material world.”[13] McHugh’s caution about an idealized sensory experience also applies in this context, although the existence of paintings, actual objects, and more observational lexicons from the eighteenth century supplement the poetic or prescriptive accounts of cooling to give a broader sense of lived experience.

The scholarship on mitigating the heat in South Asia has historically focused on the complaints of Northern European travelers, soldiers, and later colonial officials who were unprepared for the dry hot season in northern Hindustan, or the humidity of tropical areas of South Asia, and sought technologies for cooling, first by the production and importation of ice and then by electrical air conditioning.[14] However, as British accounts conceded, and as Mughal documents attest, the rulers and elite of Hindustan had put in place effective methods of cooling long before European intervention.[15] Yet by the early nineteenth century, the English-language press became dominated by British excitement over imported ice from the United States that characterized local South Asian strategies of cooling as secondary and ineffectual.

While emphasizing the sensory experiences of eighteenth-century individuals in Hindustan could seem to reinforce British and broader European stereotypes of the sensuality and bodily decadence of the “East,” it is important to understand that these biases were closely tied to related Orientalist ideas about the determinism of the climate and heat of South Asia.[16] Climatic determinism is the long-debunked idea that a region’s climate (including temperature and humidity) determined the physical, medical, and cultural characteristics of its inhabitants. According to these deterministic

theories, which became increasingly racialized in the nineteenth century, the qualities of “feebleness” and “indolence” that British writers ascribed to residents of hot and humid regions of tropical South Asia derived from the climate. These ideas implicitly rejected extant local technologies for cooling the environment, given that part of the theory of climatic determinism was the idea that residents of hot climates were well adapted to the temperature, or the strong light of the sun.[17] By this logic, they would not need to counteract the heat. A study of the non-European cooling strategies that were used in South Asia therefore not only recovers overlooked materials and multisensory phenomena from the past, but it also reasserts the scientific sophistication and aesthetic value of the manifold Hindustani methods of mitigating the heat that were dismissed in the late nineteenth century by British colonial officers and visitors to South Asia.

This study links up with current literature on the colonialist fantasies and destructive effects of completely air conditioning or “climate controlling” the environment.[18] This critical scholarship has grown within architectural history, critical infrastructure studies, environmental design, anthropology, and settler colonialism studies.[19] Hi’ilei Julia Kawehipuaakahaopulani Hobart and others have proposed the idea of “thermal colonialism” to describe the imposition of whole infrastructural systems of refrigeration and air conditioning that were introduced by European and American colonizers. Writing in the context of nineteenth- and twentieth-century Hawai’i, Hobart critiques the “ahistorical way that contemporary Americans presume that hedonics of cold are solely driven by universal biological desire, rather than being conditioned by colonialism.”[20] In other words, perceptions of the ideal temperature are relative, culturally constituted, and, over the course of the nineteenth and twentieth centuries, were forcibly reshaped by European and North American accounts of what constituted desirable coldness and comfort. Environmental studies and architectural design have also reassessed the idea of “climate control,” arguing for the importance of variety and fluctuation in thermal environments, and pointing out that following only a thermometer reading to determine coldness or heat overlooks many other factors, such as humidity, or even scent, that affect perceptions of temperature.[21]

While alternatives to climate control often engage large-scale architectural, infrastructural, and environmental projects, in this study I explore ways that these insights apply to smaller-scale, individual strategies that provided relief from the heat: objects that fit in the hand and fabrics that cooled directly on the body.[22] These more modest, intimate materials and objects were also more economically and materially accessible than the luxuries of cooling offered by monumental architecture. More pointedly, I have used this case study of northern Hindustan to trace how the nineteenth-century value placed on the large-scale infrastructure of ice, air conditioning, and refrigeration emerged from European colonial tropes of combatting the heat that denied coldness its sensory abundance. This study offers a recognition of the efficacy and ecological sustainability of multisensory means of cooling that feel increasingly vital in a warming world.

Histories of Ice, Other Ways of Imagining Cooling

In the interlinked cultural histories of West, Central, and South Asia, cool water and ice had long provided one form of relief in the hot season. Naturally occurring ice could be procured in the mountains and carried to warmer climates in the plains, where it was preserved through strategies of packing and through specially designed chambers that

kept the ice from melting. Scholars have hypothesized that by 400 BCE in Iran, methods for storing ice had emerged, the most enduring of which was the *yakhchal* (literally “ice-pit”), a conical structure that, through its dense and thick walls, preserved cold water and even ice and snow throughout the dry, hot months in the desert (**Figs. 1 and 2**).^[23] In both Iran and Hindustan, the high-altitude ice was supplemented by thin layers of ice that formed in shallow pools and containers on cool mornings, even if temperatures did not dip below freezing. This fragile ice was harvested, pounded together into thick blocks, and preserved.



Left: Fig. 1. Exterior of yakhchal, Qal'ah-i Jalali Citadel, Kashan, Iran, seventeenth century, Safavid Empire. Photo: Behzad Ayati Collection, courtesy of Aga Khan Documentation Center, MIT Libraries.

Right: Fig. 2. Interior view of brickwork, yakhchal, Qal'ah-i Jalali Citadel, Kashan, Iran, seventeenth century, Safavid Empire. Photo: Behzad Ayati Collection, courtesy of Aga Khan Documentation Center, MIT Libraries.

The search for respite from the heat appears throughout South Asian literary and textual accounts, but the specific concern with ice is most thoroughly documented in the accounts of the Mughal Empire. It is part of the lore of the foundation of the Mughal Empire, a dynasty descended from the Central Asian emperor, Timur (r. 1370–1405), that the first emperor, Babur (r. 1526–30) was dismayed to find such a hot climate when he conquered northern Hindustan in the Battle of Panipat. Babur was raised in the much more temperate regions of Central Asia, and his autobiography, the *Baburnama*, describes seasons of cold and snow. A painting made for the court of Babur's counterpart and contemporary in the Safavid Empire, Shah Tahmasp (r. 1524–75), depicts a scene from the *Shahnama*, the mythical story of kings, in which Isfandiyar scrambles with his army to erect tents in the snow. The scene is sprinkled with white specks interspersed with chalky lines that convey a dense snow and strong winds pushing against the soldiers' bodies and their blue, green, and brown felted tents (**Fig. 3**).

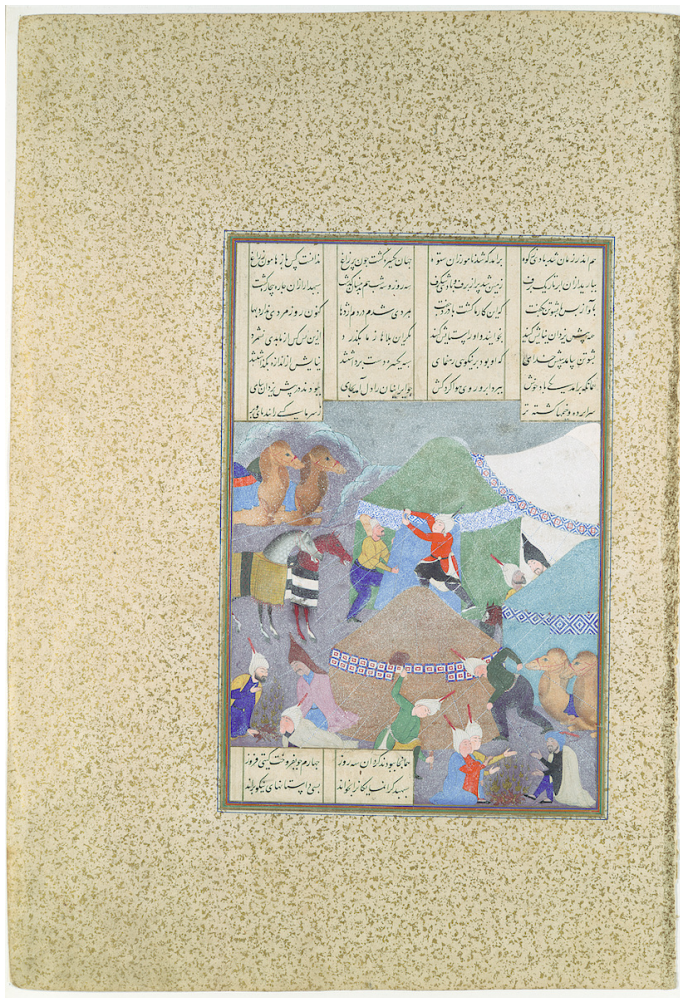


Fig. 3. Painting attributed to 'Abd al-Vahhab, "Isfandiyar's Sixth Course: He Comes Through the Snow," *The Shahname* (Book of Kings) of Shah Tahmasp, made in Tabriz, ca. 1525–30, Safavid Empire. Opaque watercolor, ink, silver, and gold on paper, 11 1/8 x 7 7/16 in. (28.2 x 18.9 cm). The Metropolitan Museum of Art, Gift of Arthur A. Houghton Jr., 1970.301.53.

When Babur and his military crossed from Central Asia into Hindustan, the landscape changed. As he wrote in his autobiography, "I had never seen a hot climate or any of Hindustan before...A new world came into view—different plants, different trees, different animals and birds, different tribes and people, different manners and customs. It was astonishing, truly astonishing." [24] As Supriya Gandhi has recently discussed, Babur's language of climate connected to existing racialized theories of ecological or climate determinism that cast the people coming from hotter climates closer to the equator as inferior to those from more temperate realms. [25] Babur often disparaged the heat. In the *Baburnama*, he described the seasons in cities in what is now Afghanistan and Central Asia with their snows, their clear, cold mountain waters, their crisp air, and their temperate weather fruits. In Hindustan, Babur complained of missing the "grapes, musk-melons or first-rate fruits" as well as the ice and cold water. [26] Yet even if he was homesick for fruits and ice, Babur found appreciation in the rainy season, writing that "while it rains and through the rains, the air is remarkably fine, not to be surpassed for healthiness and charm." [27] In his short reign, Emperor Babur simulated cooler climates through the importation of melons, oranges, and grapes. He constructed four-part gardens irrigated by water wheels. [28] Through plantings and

far-sought fruit, he attempted to recreate a temperate climate in Hindustan in his feasts and pleasures.

As Babur's grandson, Akbar (r. 1556–1605), expanded his territories and shifted his capital throughout his domains, he also placed a high value on the transport of ice, water, fruits, and scented substances to bring a sense of cool. The founding of the Mughal Empire coincided with the Little Ice Age, a period of temperature extremes that led to climatic cooling in many parts of the world.[29] However, there exists textual, scientific, and visual evidence that in South Asia, the period was experienced as one of extremes that vacillated between heavy flooding and extreme dry droughts.[30] As the sixteenth and seventeenth centuries progressed, certain regions in Mughal Hindustan, such as Gujarat and the Deccan, underwent years of intense dryness and ruined crops, causing famine and suffering, and drawing an even greater contrast with the elite pleasures in the irrigated city of Lahore as well as gardens set along the glacial lakes of Kashmir.[31]

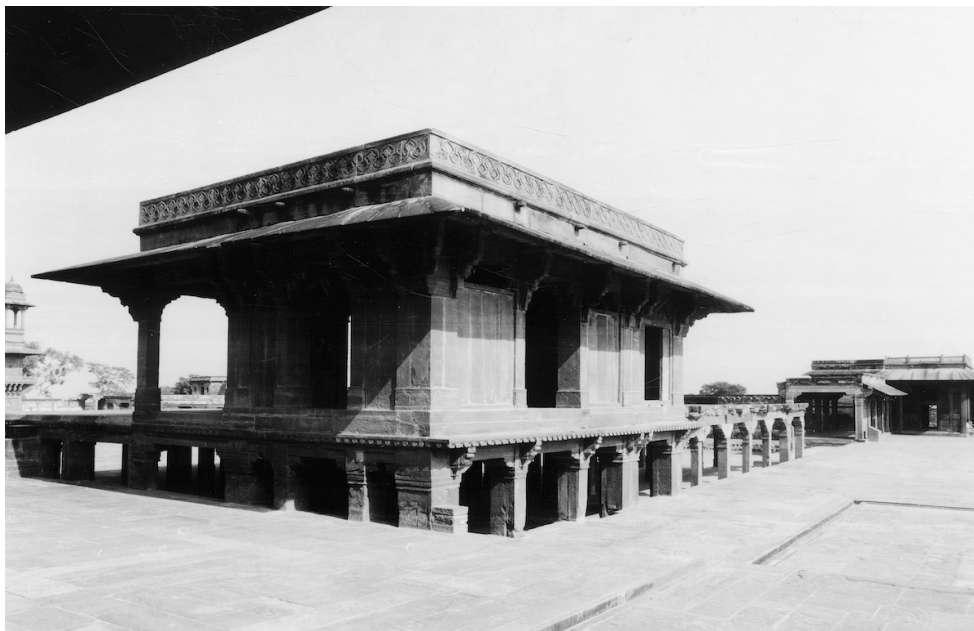


Fig. 4. Ab-dar Khana, Fatehpur Sikri, Agra District, Uttar Pradesh, Red sandstone, Mughal Empire, 1571-1575 CE. AIIS Acc No.092119, Neg No.758.79. Photo: American Institute of Indian Studies.

Early in his reign, Emperor Akbar constructed a short-lived capital at the site of Fatehpur Sikri, forty miles from the imperial center of Agra. The palace structures at Fatehpur Sikri included the *Ab-dar Khana* (with *ab* meaning water), a site that housed the beverage department that still stands as a sandstone structure with deep cisterns to cool water (**Fig. 4**).[32] The site was also used to store fruit and to hold the sacred water of the River Ganga (Ganges) that Akbar consumed each day as part of his adoption of local Indic bodily practices. As Neha Vermani has shown, the imperial official in charge of the *Ab-dar Khana* held a high-ranking role in the military and the administration and was a trusted member of the emperor's circle.[33][34]

The *Ab-dar Khana* is described in the *A'in-i Akbari* (the "Institutes of Akbar"), a text that recorded the details of Akbar's imperial state, ranging from the particulars of the household to the administration of taxable land and the composition of the military. The *A'in-i Akbari* was completed in the 1590s, at which point Akbar had relocated his court away from Fatehpur Sikri, whose flaw was that it lacked a ready water source, to the

northwestern city of Lahore, a site in closer proximity to colder, mountainous regions. The chapter on the *Ab-dar Khana* in the *A'in-i Akbari* is also unusual in reminding the reader of the emperor's present location in Lahore; the text, by court historian Abu'l Fazl, is generally written from an omniscient, mobile point of view. But in this section, the account begins by describing the water of the River Ganga, stating that when the court was located at Agra and Fatehpur Sikri, the water "came from the district of Sarun; but now that his Majesty is in the Panjab, the water is brought from Hardwar." [35]

The *A'in-i Akbari* also records a shift towards the use of snow and ice when the court moved to Lahore, a commentary on how even among the members of the imperial court, the possibility of using ice was dependent upon one's geographic location. Abu'l Fazl writes that after 1586, "snow and ice have come into use. Ice is brought by land and water, by post carriages or bearers, from the district of Panhán, in the northern mountains," which was located 45 kos (approximately 81 miles) from Lahore. He describes the "considerable profit" that dealers received, particularly when the ice was brought by water, and the fourteen stages of horses and one elephant, and the many laborers required when ice was brought by land. The prices for ice could range, but Abu'l Fazl reports that sellers sold about two to three *sers* (approximately four to six pounds) of ice per rupee. Ice was most costly when it had been brought a great distance, and prices were highest in the rainy season. Abu'l Fazl notes that "all ranks use ice in summer; the nobles use it throughout the whole year." [36]



Fig. 5. "An Abdar Cooling Bottles," from "One of Seventeen Paintings of Domestic Servants and Tradesmen," Benares, ca. 1850. Gouache on mica, 5 1/2 x 4 1/3 in. (14 x 11 cm) © Victoria and Albert Museum, London, 08089:8/(IS).

The same section of the *A'in-i Akbari* recounts intricate details about the use of saltpeter in cooling drinks. Saltpeter (potassium nitrate), a naturally occurring sodium deposit, was a plentiful material in South Asia and also a vital component of gunpowder. South Asia became the primary source of saltpeter for Britain by the seventeenth century. In addition to its use as the oxidizing agent in munitions, when saltpeter dissolves, it creates an endothermic reaction that absorbs the heat in water.[37] The *A'in-i Akbari* describes how saltpeter could be collected, strained, and purified to form a powder that was then dissolved in water. A nineteenth-century painting depicts a servant cooling water, a figure known to the British as an "*aubdar*" (from the word "*ab-dar*"). As the image suggests, sealed metal bottles of water would be placed into a vessel filled with dissolving saltpeter and water, shown here as a white frothy mixture (**Fig. 5**). Abu'l Fazl describes, "A *ser* of water is poured into a bottle made of pewter or silver or such metal and its mouth is closed. In a pan two and a half *sers* of saltpeter are mixed with five *sers* of water, and the closed bottle is moved round and round within that mixture for the space of half a *ghari* (i.e. 12 minutes). The water within the bottle gets very cold." [38] In the later painted rendering, the crisp lines of the matte gouache colors, the shaded space, and the *ab-dar's* starched white garments give a sense of a drop of temperature for the scene. The beverages in the vessel, bathed in saltpeter, would cool in less than a quarter hour.



Fig. 6. Zinc Cooling Bottle with Silver Mounts & Lacquered Fabric Covering, Mughal Empire, 18th century. H: 12 3/8 in. (31.5 cm). Image courtesy of Michael Backman Ltd, London.

A rare remaining eighteenth-century cold-water flask from South Asia demonstrates the different materials that aided in the cooling of the water bottles (**Fig. 6**).^[39] The bottle has a bulbous bottom half, where the water would be held, and a slender neck made of chased silver by which the *ab-dar* would hold onto the bottles as they were stirred in the cooling saltpeter bath. The lower half of the flask is made of zinc, a good (though not the best) conductor of thermal energy. More pertinent, perhaps, zinc does not stain and has anti-microbial qualities. Other flasks from this period were made of pure silver, a more effective conductor of heat. A woven red lacquered fabric surrounds the bottle. This was likely both an aesthetic choice and a utilitarian addition, given that cloths soaked in saltpeter were often wrapped around the bottles to cool them more intensely. Although the lacquered material would not absorb water, cold water would become lodged in the interstices of the loose weave, trapping it next to the metal. The object references water in its reflective surfaces, from the glinting silver to the shining lacquered texture of the cloth. Water also emerges in its patterns, through the layered fish-scales of the bottle's finial and the chevron-like pattern of the silver bottle neck, which resembles the movement of stylized waves. The tactile, highly worked surface of the bottle is a reminder that our thermal sense is often activated through contact with the skin: when we touch a cold bottle, we experience it as having a lower temperature because heat has passed from our hands onto the object.

The use of ice and coolants for water continued among the Mughal elite. In the accounts of Akbar's grandson, Emperor Shah Jahan (r. 1628–58), the ruler is again credited with bringing “snow and ice” from the mountains to please the court. In a passage within *The Chahar Chaman* (completed by 1647), which was written by Shah Jahan's secretary, Chandar Bhan Brahman, the mention of ice comes just after a much longer description of Shah Jahan's ability to bring “green and fresh” fruits from great distances in West and Central Asia, and from throughout the Mughal Empire, including “melons from Balkh and Karis,” the “black and purple Habshi and Sahibi varieties of grapes,” the “Samarqandi pears and apples,” in addition to “watermelons from Kashmir” and “oranges of every shape and size” that were nestled in straw or sawdust to keep them secure and dry.[40] The emperor's ability to requisition fragile perishable fruits from great distances paralleled the feat of procuring ice in the summer. After describing the distribution of fresh fruits on gold and silver plates to the nobility, Chandar Bhan writes how in the summer, an “abundance” of “ice and snow [*yakh va baraf*] is distributed amongst the principal officers, according to their respective ranks.”[41] From this telling, Shah Jahan is positioned as the principal recipient of ice that would he would then parcel out as a gift to the nobility, much like the gifts of imported fruits.

Due to its cost and exclusive use, ice was perceived as a high luxury. In the *Mirzanama* of approximately 1660, an anonymously written advice book for the aspiring *mirza*, or gentleman, ice becomes a mark of distinction. The British Museum's text of the *Mirzanama* includes the advice that having ice, or at least saltpeter for cooling, is an essential requisite for properly enjoying the feeling of the summer drink *paluda* (more commonly spelled as “*faluda*”).[42] Aziz Ahmad's summary of the text includes the advice that a *mirza* “should eat a few spoonfuls of delicate, fragrant, perfumed *paluda* (a beverage of water, flour or honey or other components). If it is possible, and if he can afford it, he should not eat the *paluda* without ice, or at least cooled by saltpeter. If this is not possible, he should not eat *paluda* or even mention its name; for without ice and without being chilled by saltpeter it does not chill the teeth.”[43] This admonition against drinking *paluda* if it is not cold enough contains two strands of information. First, it indicates that access to cold or chilled beverages was something that only a select few could afford. But perhaps more interestingly, the author focuses on the ideal bodily experience of drinking this cooling beverage. It suggests that coolness was experienced not just by tasting the drink's refreshing flavors, but also having it “chill” the inside of the mouth.

Khas Mats and the Scent of Winter

The acquisition of ice has historically been labor intensive and materially expensive, and, in textual accounts, its use was largely put towards bringing coldness to food and drinks. Ice was also inherently limited in its spread by geography and technologies of production. For those who could not afford it, or who were located too far from a source of ice, other substances and sensory experiences, such as flavor, scent, and color, were important factors in cooling.

The interlinked medical and culinary theories in Hindustan provided different perspectives on bodily temperature and the consumption of food. Within Ayurvedic writings, ice and cold drinks have historically been considered an impediment to digestion and were avoided in preference for substances of a more moderate temperature.[44] Yet as Dominik Wujastyk has argued, Ayurvedic practices were also premised on the foundational balance between hot and cold, and conceived of an

important role for “cooling” foods, which were often bitter in flavor, as well as fragrant cooling substances, such as the scent of camphor and even solutions made of pearls. [45] If ice was not recommended, clear water was. One early Ayurvedic text prescribes that “One’s water should be warmed by the rays of the sun, cooled by moonbeams, and by day and night it should be completely cleared of toxins by the rising of the star Canopus. Such water is pure, immaculate, and drives away impurities. This is called Swan water. It does not cause any fluxes, nor is it rough. It is like an elixir among drinks.”[46]

Within the Yunani bio-medical treatises that informed much of Iranian and northern Hindustani medical and culinary culture, there was also a basic taxonomy, founded in humoral theory, that distinguished between medicinal substances and foods that were hot (*garm*) or cold (*sard*), as well as the spectrum from dry to moist.[47] Spices and scents had a hot or cold valence, with camphor and sandalwood as cooling.[48] Yet foods could also be variable and fluid in their assignments. Divya Narayanan notes that the pineapple, a New World fruit, was variously considered hot and moist in certain Indo-Persian texts, but also deemed “cold and moist” in others.[49] Certain substances, such as rosewater, were used to cool the body as both a medicinal cure and a pleasantly scented beverage. Particularly for those with sanguine (*dam*) temperaments, cool drinks and dairy were an important part of the diet.[50]

Foods were accompanied by diverse alternative methods for ameliorating or imagining one’s way out of the heat through scent, color, and texture. While foods and flavors are ingested, surface contact with cooling materials can also refresh the body through the heat transfers that occur from the skin to other materials. For instance, applying henna paste to the palms and feet brings coolness. Diaphanous cotton clothing made of muslin, or *malmal*, popular at the Mughal court, provided not just a lightweight means of covering the body, but its cotton material also absorbed humidity and moisture. When a breeze caught the dampened cloth as it sat on the skin, the whole body was cooled. Perhaps for these reasons, muslin cloths were likened in poetry to cooling fountains and were given watery names, such as *shabnam* (evening dew) and *ab-i rawan* (running water); another textile was known as *tansukh*, which references the pleasure (*sukh*) it brought to the body (*tan*).[51]

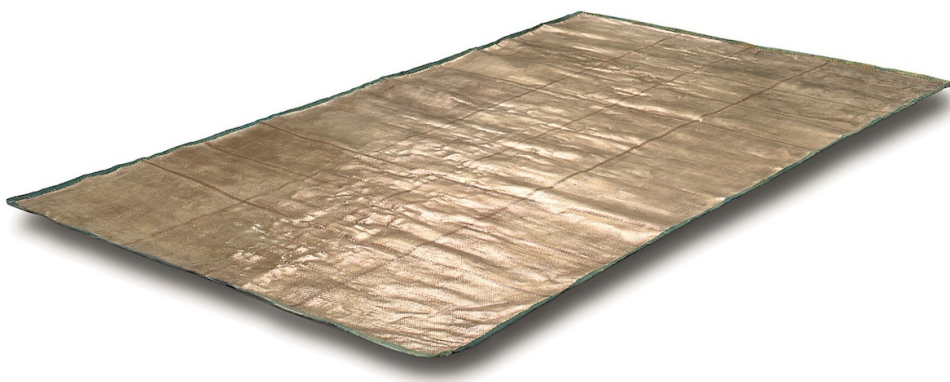


Fig. 7. Silver Thread Bed-Roll, Mughal Empire, 18th Century. Silver interwoven with copper in a cross-hatch design, 71 1/16 x 39 9/16 in. (180.5 cm. x 100.5 cm). Private Collection. Photo: © Christie’s Images/Bridgeman Images.

For nighttime, various woven materials served to cool during sleep. Flat woven bedrolls were made from shining silver threads (**Fig. 7**). As one of the most conductive metals,

silver draws heat from warmer bodies or objects. Covered with a cotton sheet, a silver surface could calm the skin at night. In the eastern region of Bengal, a less precious form of woven mat known as a *sital-pati* (which literally means “cold” or “cool” [*sital/shita*] mat [*patī*] in Bengali and Hindi) was recorded in the eighteenth century, and was still in use in the nineteenth century and into the present day in West Bengal, India, and Bangladesh. Woven from the fibers of the split stems of the *murta* cane plant (*Schumannianthus dichotomus*), the mats are thin and the front surface is glossy in texture.[52] The surface is said to be so smooth that even a snake cannot slide across it.

While mats cooled the floors and sleeping areas, screens made from *khas* or *khas-khas* (also spelled *khus*, or *cus*), the long, fragrant root of the vetiver grass (*Chrysopogon zizanioides*), created immersive cooling environments, and have continued to do so.[53] When doused with water, these screens release a fresh scent that was said to bring “winter” in the midst of the heat. *Khas* screens appear in the *A'in-Akbari* as part of the emperor's quest to find cool in Hindustan. After lauding the “arable” and “productive” soil of Hindustan, the abundance of “mines of diamond, ruby, gold, silver...,” and praising the elephants and “perfumes and melodies” of the empire, Abu'l Fazl recounts Akbar's chief complaints about Hindustan that mirror those of Babur: its “lack of cooled water, its excessive heats, the scarcity of grapes, melons and carpets, and of camels.” Yet Akbar has “remedied these deficiencies. Saltpeter is now extensively used for its cooling properties, and high and low appreciate the benefit of snow and ice brought down from the northern mountains...Skilled hands from Turkestan and Persia...sowed melons and planted vines, and traders began to introduce in security the fruits of those countries.”[54] In the midst of these references to saltpeter, ice, and fruits, Abu'l Fazl writes: “There is a fragrant root, very cool [*khunuk*], which is called *khas*. By His Majesty's command, it became common to make huts of bamboo frames (*nai-bast khana-ha*) stuffed with it. When water is thrown on it, winter seems to arrive in the midst of summer [*zamistan digar dar tabistan padid ayad*].”[55] Abu'l Fazl attributes the creation of a space scented with *khas* to Emperor Akbar, although descriptions of *khas*, known as *usīr* in Sanskrit, are present in early Ayurvedic texts.[56]

Elsewhere in the *A'in-i Akbari*, Akbar is given less credit for this “invention.” In a section on building materials, Abu'l Fazl writes, “*Khas* is the sweet-smelling root of a kind of grass, which grows along the banks of rivers. During summer, they make screens of it, which are placed before the door and sprinkled with water. This renders the air cool and perfumed. Price, 1 ½ Rs. per man [approximately 30-40 pounds].”[57] Here, the text is more impersonal about who created *khas* screens and also provides a price, which can be compared to the much greater cost for ice; ice was nearly forty times the cost of *khas* by weight. In a short note on this passage, Irfan Habib points out that in the *Bahar-i 'Ajam*, another eighteenth-century Indo-Persian lexicon, this use of *khas* is noted to be “peculiar to India.”[58]

The *khas* screens represent a distinctive form of cooling from ice, which acts by lowering the temperature of the air or liquid around it as the frozen water melts, and saltpeter, which absorbs the heat in water as it dissolves. By contrast, *khas* cools both through changes to the atmosphere, as dry air acquires moisture when it passes through the wet mats, but also through altering the scent of the air. It is the scent that, according to Akbar's accounts, makes winter seem to “arrive in the midst of summer.” Within Ayurvedic medicine, *khas* was long linked to cooling medicinal treatments and foods that are identified as cold.[59] Recent scientific studies of the neurology linking scent and temperature have suggested that certain smells are not only experienced by

olfaction, the sensory system of smelling, but also by the trigeminal neurons, which are used by the face to gauge temperature.[60] The most prominent cooling scents that have been studied include menthol and mint, but the scent of *khas* (vetiver) also affects trigeminal stimulation. In this way, *khas* might have the function of signaling to the body that it is cool when this scent is released.

By the eighteenth century, *khas* screens appear in paintings from the courts of the northwestern region of Rajasthan, allowing for an approximation of the structures made from these woven materials. The Rajput courts of Mewar and Amer-Jaipur shared with the Mughal court many practices of adorning and maintaining outdoor spaces. During the hot season, cotton cloths were spread over marble floors so that the cool of the stone could be felt beneath. Tents and chick screens were erected to protect against the sun. Known as *khas khana*, the structures seen in Rajput paintings seem to have been fashioned as Abu'l Fazl described from a bamboo frame from which are hung screens of the woven *khas* (*khas-ki tattli*).[61]



Fig. 8. Attributed to “the Stipple Master,” *Rana Amar Singh II with His Consort in a Garden Pavilion*, Mewar court, Rajasthan, 1705. Opaque watercolor on paper, 12 5/8 x 8 7/8 in. (32.1 x 22.5 cm). National Museum of Asian Art, Smithsonian Institution, Freer Collection, Purchase and partial gift made in 2012 from the Catherine and Ralph Benkaim Collection—Charles Lang Freer Endowment, F2012.4.4.

In one painting of a humid scene from circa 1705, Rana Amar Singh II of Mewar is depicted with his consort in a garden (**Fig. 8**).^[62] In the foreground, fountains spray silvery-gray water in looping lines, a peacock fans his tail, and musicians perform wearing gray and pale pink garments studded with pearls. In the sky, blots of gray laced with golden lightning suggest thunder clouds rolling in. This painting bears the quintessential seasonal iconography of the monsoon season, when the rains arrive to bring relief from the hottest temperatures of the summer.^[63] The depiction of the *khas* grass in this context is a reminder that identifiable iconography is just one of the multiple ways that this painting communicates the season and the arrival of refreshing cloudy weather. Recent interdisciplinary scholarship in South Asian studies has explored how paintings, music, and poetry conveyed “monsoon feelings”—the anticipation of the cooling rains and release from the heat. ^[64] As Dipti Khera has written, it is through these representations of the feeling (*bhava*) of a place experiencing a bountiful rain that “the potentiality was actualized.”^[65]

Figure 8 also captures a multisensory environment. The artist has conjured the humidity in the air by dampening the vibrancy of the colors, as though the water vapor in the air is muting their hues. The artist depicts sound not only through the presence of the musicians, but also through the gestures of Rama Amar Singh II, which move in time to the beat of a raga.^[66] Beyond the senses of vision and sound, activated through color and gesture, however, it is the inclusion of the *khas* screens that allow the paintings to communicate scent and even temperature. The painter has captured the subtle texture of the *khas* screen. In actual practice, the grasses are woven in long and regular but loose rows that appear as vertical hatch lines in the painting. The grasses are thick and pliable, since it is the oils in the grass that release the scent. The painter has captured the three-dimensionality of the *khas* screens by rendering the grasses with slightly curving, irregular upright lines, suggesting the texture of the woven grass slightly bulging out from the flatness of the walls. The *khas* grass covers the interior of the hut and the exterior, where it is darker in color and adorned with garlands of sweet-smelling flowers, lotus petals, and leaves. Inside the hut, the bodies of the Rana and his consort are carved out from the white floor more clearly than any of the other figures in the painting. Between the lovers, an arched window has been painted with a wash of pigment that in its pooling edges and silvery color still appears to be wet, evoking cold water inside. The sharp lines of the bodies set against the light color of the floor makes it seem as though the cooling of the *khas* has made the air crisp within the enclosed, fragrant space.

In paintings, it is the central figures who are cooled by the air passing through *khas* grasses, indicating the high status of those within. Although they are not depicted, we know from textual accounts that laborers would need to work outside of the *khas* structures to continually douse the mats with water. *Khas* also appears in Anand Ram Mukhlis’s dictionary, where he mentions that in Hindustan, an attar, or perfumed oil, is made from *khas* whose scent is very “cold.” Here he uses the Hindi word for cold, *thand*.^[67] For Mukhlis, *khas* is defined in part by its associations with elite use: “It is a kind of grass which emits fragrance, especially when it is wet in water. In Hindustan the persons of status and wealth use it in summer, by arranging it in a particular manner and watering it which makes the apartments extremely cool [here the word used is “*sard*”]. They call it *khas khana*.”^[68] Mukhlis’s comment is a reminder that only the privileged enjoyed the coolness of *khas*, while laborers worked in the heat to refresh the screens with water, or to fan those within.^[69]

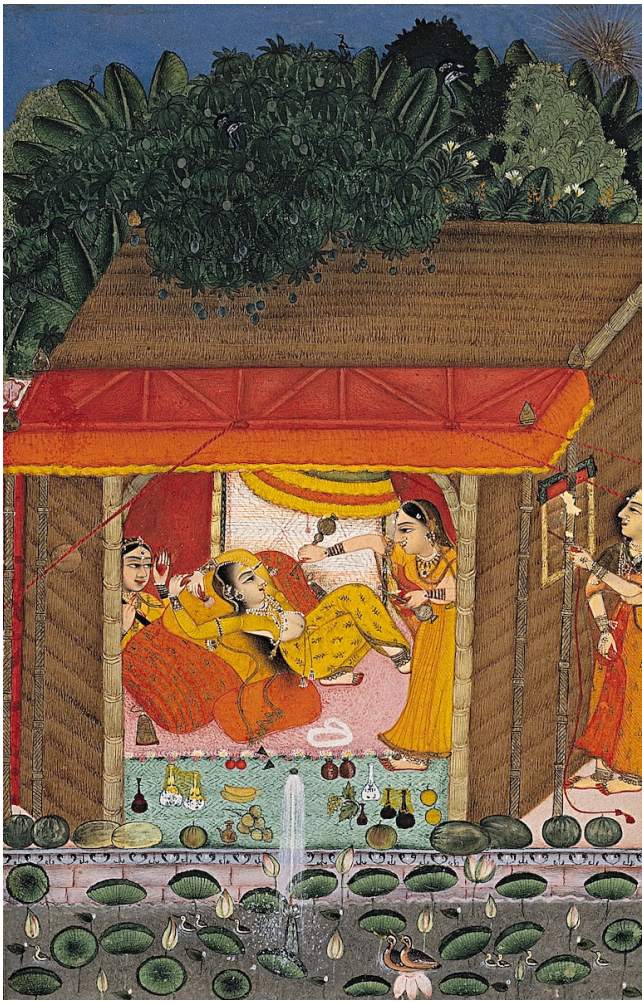


Fig. 9. Savant Saranga Ragini (from Megha raga), Folio of the "Boston Ragamala Series," Bundi, Rajasthan, or Kota, Rajasthan, ca. 1770. Opaque watercolor on paper, overall size: 13 7/16 x 9 7/16 (34.2 x 24 cm), image size: 7 5/16 x 4 3/4 in. (18.5 x 12 cm). Museum Rietberg, RVI 957, gift of Eberhard and Barbara Fischer © Museum Rietberg, Zürich. Photo: Rainer Wolfsberger.

The paintings that depict the *khas* weavings are primarily those associated with the *ragamala*, or "garland of *raga*" tradition. The paintings depict embodied enactments of the seasonal musical modes (*ragas* and *raginis*), corresponding to poetic verses that narrate the feelings of love, longing, discomfort, serenity, and pleasure that the various seasons and moods will bring.[70] Another *ragamala* painting that includes an image of *khas* from later in the eighteenth century (ca. 1780) in Kota depicts the rainy season's Savant Saranga Ragini (**Fig. 9**).[71] This is one of the musical modes classified under the broader category of Rag Megh (also written as Megha), a *raga* that is sung during the season of the clouds (*megh*). Savant Saranga is a monsoon *ragini*, as indicated by the mineral blue sky above the scene, the densely hanging vegetation, and the peacocks peeking their crests out above. But in the main part of the scene, the reclining female figure cannot get cool. Her attendants serve her drinks in elegantly fluted rosewater bottles that have perhaps been chilled in saltpeter. The whole interior scene of the pavilion is one of burning orange hues and glowing turmeric colors. These colors end instantly when they collide with the flat, neutral brown of the *khas* pavilion, perhaps suggesting a change in heat and feeling. The *khas khana* is carefully described in this painting: the artist has rendered the structure made from bamboo stems with their

characteristic protruding nodes and has shown how the deeper woven brown *khas* grass has been arranged in rows. Again, the bulging rounded lines used to render the hut suggest a thicker and more substantial screen of *khas* grass. We even see an attendant at the *khas khana*'s window, pulling a cord to open or close the shade.

The depiction of these cooling *khas* screens within *ragamala* paintings suggests how another sense, that of sound, could bring relief in the midst of unbearable heat. The *raga* melodies themselves were understood to activate changes in the temperature. The best-known story related to this phenomenon is about Tansen, the famed musician at Emperor Akbar's court who is attributed with having composed many lasting *raga* melodies. In the story, Emperor Akbar requests and then demands that Tansen perform one of the most intense, heat-inducing *ragas*, known as *Raga Dipak*. In one recounting of the story, Tansen requests two weeks to practice, during which time he teaches his daughter, Sarasvati, to sing *Raga Megh Mallar*, a cooling melody that he knows will work as an antidote and will bring the rains. Indeed upon his recital of *Raga Dipak*, Tansen's body is overtaken by a burning sensation, at which point his daughter sings the monsoon *Raga Megh Mallar* and Tansen's fire is quenched and he is saved.[72] The *ragamala* paintings depicting variants of *Rag Megha* bring together these sensory properties of cooling: the muted colors in the sky, the evocations of a calming *rag*, and the scent of *khas* all working together to lower the temperature and bring on the rains.

New England Ice and "Some relief we may enjoy"

By the nineteenth century, when the British had established their main cities of the empire at Calcutta, Madras, and Bombay, the varied means of cooling gave way to imported ice. Since discomfort in the heat had long been a chief concern, Europeans in South Asia had previously appropriated many South Asian methods for relief from the heat in the summer.[73] As early as the seventeenth century, there were ill-fated proposals at the English court to introduce methods of cooling using saltpeter to Emperor Jahangir (r. 1605–27), although Mughal documents suggest that this method was already well in use in Hindustan.[74] By the eighteenth century, Europeans in South Asia employed an "*ab-dar*" to cool their drinks, and had adopted the use of *khas* screens, even attaching the *khas* screens to a mechanical fanning system that had to be consistently turned and became known as the "thermantidote." Various pulley systems and large cloth fans, known as *pankahs*, were used to move the air throughout interior spaces.[75]

Having determined that requisitioning ice from the mountains was too costly, the British at first looked to local, South Asian methods of cooling and ice creation.[76] This involved leaving a few inches of water in numerous porous earthenware vessels overnight. In the cool of the evening, even when temperatures did not drop below freezing, very thin layers of ice would form on the surface and bottom of these vessels that could then be pounded together to form a larger block of ice. At times, saltpeter was also used to further the cooling. Rajani Sudan argues that the quest for ice among European officials in South Asia related to an "entire cultural imaginary of a contained or controlled landscape, untrammelled by climatic realities." [77]

The colonial vision of containing or controlling the heat was fulfilled in 1833 when the first ship bearing 180 tons of New England ice arrived in Calcutta from Boston. The Boston businessman Frederic Tudor (1783–1864) began shipping ice from Boston to the southern United States, the Caribbean, Brazil, and then further abroad to South Asia in the early nineteenth century.[78] Tudor and his partner Nathaniel Wyeth

determined that regularly cut rectangles of ice suffered less melting loss, they covered the ice with sawdust, and they designed double-walled insulation aboard the ships to prevent melting. They also fashioned ice houses that preserved the ice upon arrival. The ice was carried as ballast for low freight rates on ships and, when it reached India, was exempt from import duties.[79] The imports from New England were lauded in the British press for the solidity and clearness of the ice that was now available in the major cities of the British Empire. Given the price, the ice was limited to an elite of both British imperial officials and wealthy South Asian merchants in the cities, although the British tried to keep the best quality ice for themselves.[80] On a hot day in June 1837, an anonymous writer (using the name “Corn Cob”) proclaimed appreciation for the ice while casting aside previous methods of cooling:

*Now kus kus tatties fail to cool
And punkah breeze defying
The mercury marks 95
And we are almost frying.
....Still, some relief we may enjoy,
For with our ‘dall’ and rice, Sir,
Liquids become a luxury
From Yankee Tudor’s Ice, Sir.[81]*

In this poem, the *khas* screens and the “punkah” fans are supposedly failing to cool when the “Yankee Tudor’s” ice from the United States arrives. Though seemingly a frivolous change—the ice was used to cool cocktails and claret wine—the displacement and devaluing of indigenous methods of cooling upon the arrival of the imported ice connected to broader British colonialist discourses that sidelined local scientific knowledge in South Asia as “primitive, obscure, ineffectual, and rudimentary.”[82] Moreover, the decision to substitute locally sourced ice with an energy-intensive import paralleled much larger shifts in trade and manufacturing in the mid-nineteenth century, whereby the British displaced and disrupted the renowned cotton textile industry of South Asia by flooding markets in India with British machine-made cloth. [83]

New England ice remained dominant in South Asia and throughout many colonial cities of the British Empire until the late 1870s and early 1880s, when the system started to flounder due to climate warming in Massachusetts (brought on by both cyclical atmospheric warming and fossil fuel pollution), which drove up prices for naturally occurring ice. By the late nineteenth century, natural ice from New England was being substituted with manufactured ice made through mechanical refrigeration.[84]

Conclusion

Just on the eve of the arrival of New England ice, Thomas Wise, a British official in India, wrote about the distinction between “solid ice (*pakka baraf*); thinner ice that began to congeal later into the night (*paperi*); and the thinnest ice that froze only shortly before dawn (*phúl baraf*).”[85] As Thomas Simpson notes, Wise was recording the different local Hindustani names for the substances that could come under the category of ice, each with its unique materiality. There was the solid, whole, and properly “cooked” ice (*pakka*); the ice that was as thin as paper (*paperi*), and the blooming flower of the ice

that came before dawn (*phul baraf*). These variants of ice had distinctive tactile properties, behaved differently as cooling substances, and brought to mind various associations of solidity and floral fragility. Writing a century after Anand Ram Mukhlis, Wise's observations conjure the image of Emperor Bahadur Shah peering out at the cracks in the thin morning ice, when "his eyes sometimes would catch the cracks in sheets of ice. On this he used to wait and learn a moral." If there is a moral, it might be in the conclusion to the story of the colonizer's ice replacing pliable sheets of woven *khas*, or of energy-intensive travel that was valued over passive means of freezing. As mechanical cooling (and chemical coolants) have contributed catastrophically to the warming of the climate, the path forward may be found in these gentler materials and techniques that draw on all the senses to achieve a feeling of cold.

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[57] Abu'l Fazl, *Ain i Akbari*, 1:224.

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[74] Vera Keller, “Air Conditioning Jahangir: The 1622 English Great Design, Climate, and the Nature of Global Projects,” *Configurations* 21 (2013): 331–67.

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[76] Simpson, “Imperial Slippages,” 205–27.

[77] Rajani Sudan, “Chilling Allahabad: Climate Control and the Production of Anglicized Weather in Early Modern India,” *Journal for Early Modern Cultural Studies* 8 (2008): 67.

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[79] Dickason, "Nineteenth-Century Indo-American Ice Trade," 61, 69.

[80] Dickason, "Nineteenth-Century Indo-American Ice Trade," 73; Simpson, "Imperial Slippages," 209.

[81] From *Englishman* (June 8, 1837), quoted in Dickason, "Nineteenth-Century Indo-American Ice Trade," 71; poem also printed in Ranabir Ray Choudhury, *Glimpses of Old Calcutta* (Bombay: Nachiketa Publications, 1978); and "American Ice in British India: the Art of Keeping Cool!" *The Heritage Lab*, May 14, 2022, <https://www.theheritagelab.in/ice-british-india-art/>

[82] Rajani Sudan, "Chilling Allahabad: Climate Control and the Production of Anglicized Weather in Early Modern India," *Journal for Early Modern Cultural Studies* 8 (2008): 68. Sudan notes that after 1850, the British also lost interest in techniques of cooling because they had begun relocating during the summer months to the hill towns of the Himalayas.

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[84] Dickason, "Nineteenth-Century Indo-American Ice Trade," 79–81.

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