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John Constable, Luke Howard, and the Aesthetics of Climate

NICHOLAS ROBBINS

An interwoven mass of clouds plays across the surface of the oil sketch that John Constable (1776–1837) completed on August 1, 1822 (Fig. 1). This vaporous matter, crested with white, is charged with a sense of visual and material mobility that appears unheeding even of the picture's boundaries. Such an image exemplifies the sense of the sky, as the critic William Hazlitt wrote in 1824, as "that endless airy space, where the eye wanders at liberty."[1] Yet to look too closely at the clouds might somewhat miss the point. Indeed, if we turn Constable's oil sketch over, we find the painter's faded ink notations, which record the conditions of the study's making: "11 o clock A.M/very hot with large climbing clouds/under the sun./Wind westerly." Such descriptions of the artist's sensory experiences, found on many of his oil sketches, suggest that Constable saw clouds instead as indices of larger aerial movements of matter and energy, situated in a continuum of marked time and spatial extension.[2] Thus, the seemingly unmediated, momentary visual "liberty" inscribed on the painted surface is secured to a more extended form of observation, iterated across the dozens of oil sketches Constable completed in the early 1820s, in which momentary sensations are coordinated and anchored in place and time.[3]

The bifurcated descriptive systems on the verso and recto of Constable's cloud study might be seen to represent a wider issue. How does momentary sensory experience relate to systems that spread beyond the frame and scale of representability? What does painting have to do with data?[4] Climate change has engendered just such a crisis of perception: a confrontation with the impossibility of seeing, let alone representing or comprehending, a multivalent ecological disaster operating across the planet on an extrahuman scale.[5] At the same time, the presently unfolding manifestations of climate crisis—catastrophic floods, droughts, intensified storms—are inescapably and violently present, especially to those made particularly vulnerable to its effects by the unequal ecological legacies of colonialism.[6] As I will argue, similar problems—of reconciling larger temporal and geographic scales with more immediate sensory experience—attended early nineteenth-century attempts to represent climate itself. As opposed to the transient, local phenomenon of weather, climate would increasingly be defined in the developing scientific discipline of meteorology as a calculated abstraction fashioned from long-term aggregation of empirical data. In the early decades of the nineteenth century, artists and scientists fashioned new modes of visual representation adequate to climate's elusive forms.

The work of Constable and of the meteorologist Luke Howard (1772–1864) exemplifies such experiments. The relationship between the artist and the scientist has been subject to a decades-long debate. The animating question is whether or not Howard's meteorological theories and, in particular, the cloud classifications he proposed in 1803 influenced Constable's practice of cloud sketching on Hampstead Heath on the outskirts of London.[7] Indeed, it is a sense of spectatorial "liberty" that art historians have been somewhat reticent to relinquish to the disciplining gaze of Howard's classifications (Fig. 2), which converted clouds into more-precisely signifying forms—cumulus, cirrus, stratus, nimbus—that he termed "modifications."[8] Rather than pursuing questions of influence or priority, I will read their work together, taking seriously both the epistemological significance of Constable's landscape painting and the aesthetic structures of Howard's modes of scientific representation. In the course of his work on climate, Howard produced a panoply of "epistemic images," defined by

1 John Constable, *Cloud Study*, August 1, 1822, front (*above*): oil on paper laid on canvas, back (*right*): ink on paper, 12 × 20 in. (30.5 × 50.8 cm) overall. Yale Center for British Art, New Haven, CT (artwork in the public domain; photograph provided by Yale Center for British Art)

Lorraine Daston as images that represent "nature selected, distilled, refined, and perfected."[9] His visual experiments explicitly reflected upon and responded to the challenges that climate posed to traditional modes of representing natural systems. As such, I will explore Howard's scientific and aesthetic experiments at some length, in order that they might serve as an interpretive model for understanding Constable's own "selected, distilled, refined" representations of what the artist called England's "climate of more than vernal freshness."[10]

"Painting," Constable famously claimed in 1836, "is a science, and should be pursued as an inquiry into the laws of nature." Landscape painting might then best be understood as a "branch of natural philosophy, of which pictures are but the experiments."[11] Art and science were not so separate in early nineteenth-century London: in fact, they shared a building. The elite London institutions to which the artist and scientist belonged—the Royal Academy and the Royal Society—were both located in Somerset House on the Strand. This urban setting, and its imbrication in the wider geographies of British imperialism, was a key nexus for the visual experimentations under examination here. Both Constable's exhibition paintings of the Stour Valley in Suffolk and Howard's graphic compressions of meteorological data taken at London's outskirts were produced to circulate in the metropolis. More precisely, as I will discuss, these

visual forms were produced in opposition to London's climate and its famously occluded, polluted air. By explicitly displacing the artificial climate of urban modernity, the artist and scientist constructed an image of England's climate as stable, healthful, and "normal."

2 [Frederick Christian?] Lewis, after Luke Howard, illustration of cirrus, cumulus, and stratus clouds, from Howard, *On the Modifications of Clouds*, London, 1832, opp. p. 4, aquatint (artwork in the public domain; image provided by British Library, London, © British Library Board; all rights reserved/Bridgeman Images)

Constable and Howard were working at a time when meteorology and climatology, in their modern senses, techniques, and aims, were only beginning to develop. The history of meteorology and shifting conceptions of climate in the eighteenth and nineteenth centuries have been the subject of recent, incisive studies in the history of science.[12] Yet the role of art and visual representation in the history of climate science and its production of the environment's "normal," averaged state remain understudied.[13] Far from inevitable, this emergence of climate-as-information has a particular history, and art and visual representation are central (not supplementary) to it. Constable's and Howard's projects, as such, are key elements within the history of climate's definition in European industrial modernity.

I will begin by considering the particular challenges that climate posed to visual representation—and in particular, the forms of aesthesis and sensation its temporally extended scale entailed. I then turn to the decades-long work of observation, record keeping, and graphic representation that subtended Howard's work on his multivolume *The Climate of London* (1818–33), which offers a key site for understanding how sensory experience might be compressed into a mediated, contained image of climate—one that was shaped by the disciplinary visuality of early nineteenth-century Britain. Howard's charts and graphs allow us to reinterpret Constable's exhibition paintings and their production of a self-enclosed, averaged, carefully calibrated representation of England's climate that would be able to circulate within London's crowded exhibition spaces. Yet in Constable's painting *The Opening of Waterloo Bridge* (1832), in which he attempted to paint the climate of the city itself, the artist's calibrated aesthetic system broke down. Such a breakdown illuminates the broader challenges that climate (and its artificial modifications) poses to aesthetic systems and the problem of the body's estrangement from an environment increasingly known by data and abstractions.

FEELING CLIMATE

Romantic visual culture is often characterized by its allegiance to the fragmentary, the partial, and the anomalous. Yet what emerges from the aesthetics of climate in the early nineteenth century is the invention of new modes of aesthetic wholeness that attained to average rather than aberrant form.[14] Instead of conceiving the air as a space of "liberty," such images of atmosphere formed the basis for a regulatory perception that could grasp climate's elusive material and temporal constitution. As Howard wrote, faced with the "detached portions of observation" spanning decades that composed his data in *The Climate of London*, "*a whole* was the first thing to be done."[15] It was such aggregation—such a *"whole"*—that we might see as the work of Constable's large exhibition landscape paintings, or "six-footers," such as *Stratford Mill* (1820; Fig. 3). While the cloud study's decentered composition verges on formlessness, *Stratford Mill* is rigorously structured by the cruciform meeting of waterways at the painting's center. Whereas a sense of movement and aerial velocity is deposited in the cloud study's

3 John Constable, *Stratford Mill*, 1820, oil on canvas, 50 × 72 in. (127 × 182.9 cm). National Gallery, London (artwork in the public domain; photograph © National Gallery, London/Art Resource, NY)

very facture, in *Stratford Mill* the sense of light, breezy mobility is articulated by objects and forms distributed across the canvas and rendered in differentiated modes and scales of facture. Though intentionally suggestive of a single moment in time, *Stratford Mill* exhibits an accumulation of temporalities: that of the fishing figures lingering at the river's edge in the painting's foreground; that of the speed of the water flowing in the river, pooling around the lily pads; that of the more rapid wind ruffling the leaves of trees and of the slower movement of clouds.[16] As Constable related to the engraver David Lucas, the painting aimed to capture the landscape's temporally extended "natural history": how the left-hand bank of trees had grown at an angle, responsive to the direction of the prevailing winds, and how a slow seep of water had caused the death of a tree seen farther down the river.[17] In contrast to the (fictive) instantaneous vision exhibited in the cloud study, *Stratford Mill* stages an attenuated process of looking—a visual movement across the painting's depicted space that apprehends the unity of the landscape across various temporal speeds and scales.

If the fragment is associated with an intensity of sensation and presence, such forms of wholeness suggest other, perhaps more submerged modes of aesthetic sensibility. Constable would famously write in a letter of 1821 that "painting is but another word for feeling."[18] We might accordingly reframe the attempt to represent climate in the early nineteenth century as a problem of "feeling"—that is, of aesthetics. The aesthetic, in this sense, signals less the delimited domain of art than it does the wider domain of sensual experience and perception, as well as their embodiment in visual and material forms. It seems straightforward enough to understand "feeling" in Constable's usage as a marker of his own affective, interiorized experience. Yet he would equally claim that "painting should be *understood* . . . [not] only as a poetic aspiration, but as a pursuit, *legitimate, scientific, and mechanical*."[19] What kind of feeling pertains to the "*legitimate, scientific, and mechanical*"?

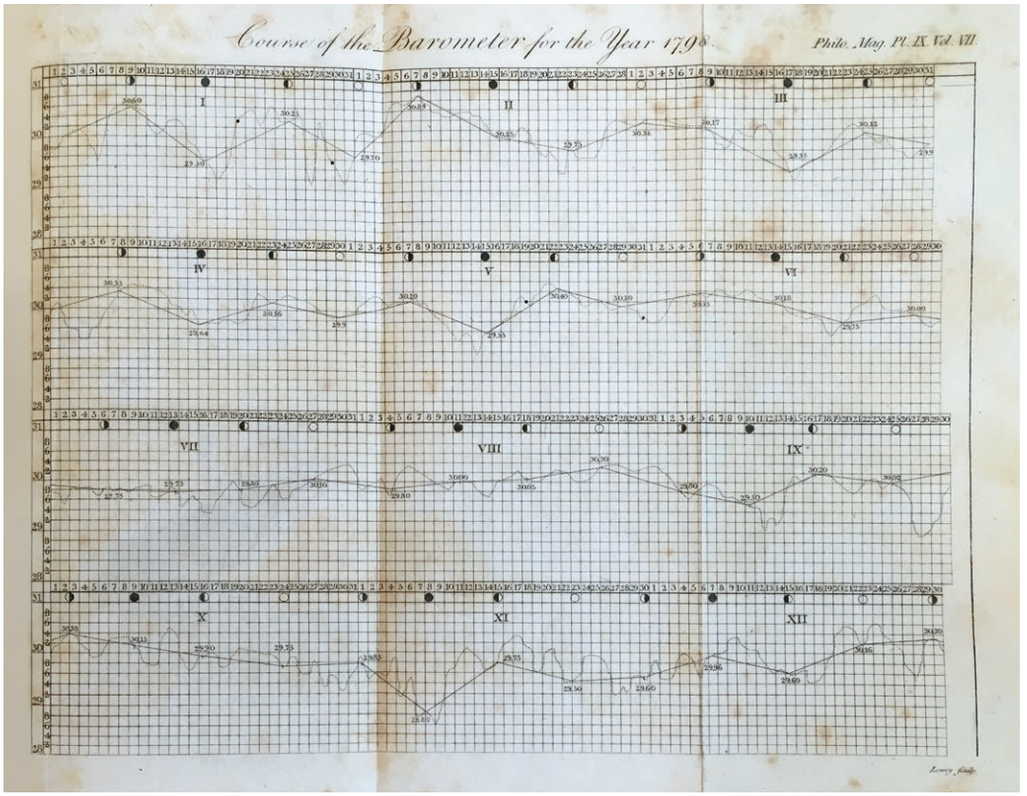
Howard's writing on meteorological observation provides a possible response. In Howard's words, the body's immediate means of "*feeling*" its environment are intrinsically "comparative," imprecise, and elusive, which is to say, undisciplined and illegitimate.[20] In order to make comparative judgments formed over time, one requires instruments and means of representation that can mediate such feeling. Such representations fixed in standardized ways, as Bruno Latour has argued, crucially become mobile and comparable, able to be shared by a distributed community and to constitute the basis of knowledge.[21] Over the course of careful and repetitive observation, Howard writes, a different kind of sensation emerges: "the pleasure of study resolves itself sooner or later into the feeling of the gradual acquisition of knowledge, the perception of the relations, agreements, and differences of facts, and their orderly arrangement in the mind."[22] This form of historical, temporally dilated feeling opens upon knowledge—a perception of "facts" and "orderly arrangement" rather than fragmented immediacy. The inscriptions on the verso of Constable's oil study—mixing sensory experience and numerate facts—attempted, in one way, to anchor this image within a broader matrix of "orderly arrangement." But in the end, it was his meticulously painted and carefully calibrated exhibition paintings—not his sketches—that were to be the vehicles of such attenuated sensation.

The form of knowledge production that would come to administer the "relations, agreements, and differences of facts" was that of statistics. As Theodore M. Porter, Ian Hacking, and other historians have shown, the 1820s saw the rise of statistics and its numerate redescription of the social world.[23] Meteorology and statistics were joined in their emphasis on the gathering of wide swaths of data and the compression of that information into averages and norms.[24] And indeed, as shown in Georges Canguilhem's seminal history of medical discourse, the 1820s were likewise significant for the consolidation of the coconstituted categories of the "normal" and the "pathological."[25] The construction of a calculated average or "norm" of meteorological conditions through visual representation forms one part of what I will term the "normal landscape": an aesthetics of climate that emerged at a historical moment when the numerate fact and its averaged aggregations increasingly came to inhabit the vaunted position of precise, circulatable knowledge. The aesthetic experiments examined below attempted to imagine how such forms of knowledge could be pictured and the forms of feeling such picturing would elicit. In turn, both Howard's and Constable's compressed, averaged representations of England's "normal" climate also came to serve a normative function. They presented an image of England's climate as an integral, stable object separated from the supposedly "pathological" climates of urban modernity.

LUKE HOWARD AND THE NORMAL LANDSCAPE

Place beside Constable's *Stratford Mill* an image like the one that Luke Howard published in 1800 (Fig. 4), which accompanied his essay in the *Philosophical Magazine* considering the relationship between barometric pressure and lunar cycles in 1798.[26] This image of the rising and falling of air pressure suggests a radically altered notion of how the experience of landscape and its climate might be represented: an engraving of experimental data arrayed along a coordinate grid that expresses temporal duration. Though now ubiquitous, this format, which we would commonly call a graph, was a very recent addition to the visual language of science.[27] This particular graph was among the earliest of its kind to be published in a British scientific periodical, and it inaugurated Howard's long experimentation with graphic modes of scientific representation.[28] Trained as a chemist, Howard was a prominent member of London's Quaker upper middle class, having founded a prosperous chemical firm in 1798 that was based first in the capital but then was moved to Plaistow and later to Stratford—both in the

suburban outskirts of rapidly expanding Georgian London.[29] He was principally renowned, both in his time and in ours, for the system of cloud classification he first proposed in 1802 at a meeting of the Askesian Society, a scientific association primarily composed of Dissenting Londoners who were largely excluded from elite institutions of learning. His "Essay on the Modifications of Clouds" was subsequently published in the *Philosophical Magazine* before being reprinted and excerpted in multiple forms throughout the century.[30] But his 1800 graph was more germane to the subject of climate itself—the subject that would dominate his lifelong meteorological research and culminate in *The Climate of London.*

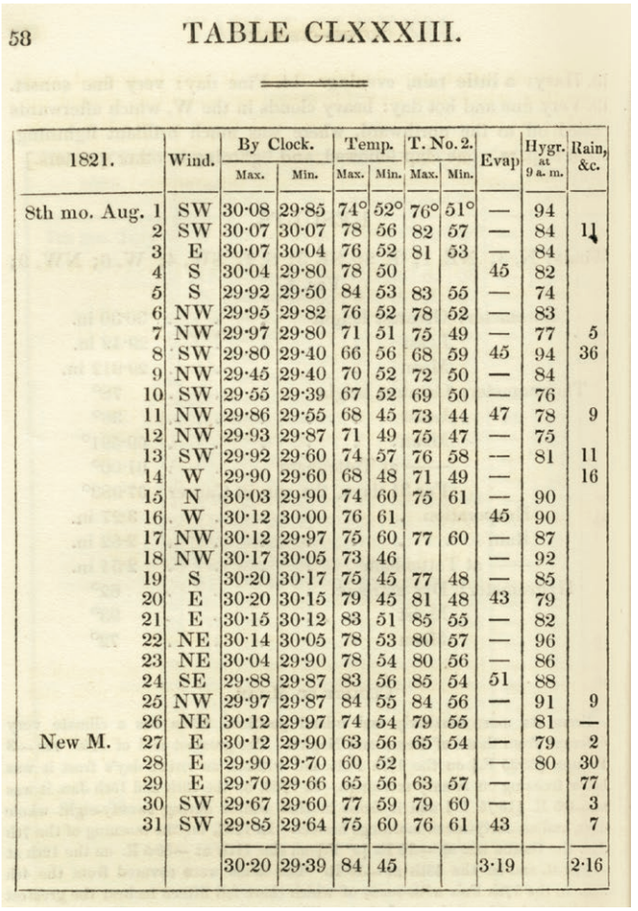


4 Engraved chart from Luke Howard, "On a Periodical Variation of the Barometer, Apparently Due to the Influence of the Sun and Moon on the Atmosphere," *Philosophical Magazine* 7, no. 28 (September 1800): opp. p. 312 (artwork in the public domain; image provided by the author)

Howard's 1800 graph stages a fundamental scission between momentary feeling and the temporally extended representation of climatic knowledge. This graph derived from Howard's daily observations kept on a preprinted coordinate paper.[31] That paper, which folded up to pocket size, perhaps traveled with him through the course of his days in 1798 as he pursued the repetitive labor of observation.[32] Rather than merely recording the sinuous curve of barometric pressure as it rose and fell, as earlier naturalists had in their experimentations with graphs, Howard's published chart shifted toward analysis, presenting an approximated average of barometric pressure periodized by the lunar cycle. Darker, straight lines are stitched together to represent this more strongly registered average. Against this average, the fainter, jumpy line recording his daily barometric readings—which were indices of momentary sensation—recedes. The production of this average, which could never be experienced by Howard, was the aim of this graphic ordering of numerical data. As Mary Poovey has argued of the emergence of the "modern fact," such information hangs suspended between its reference to a particular inductive experience (the yield of the "immediate senses") and its coordination to a broader system of knowledge.[33]

In these early visual experiments, we can see Howard's attempt to work through the limitations of the most typical form of displaying meteorological information: the table.[34] As they were for all meteorologists in this era, tables were the container of information for Howard's extended project of observation. He collected continuous records of temperature, barometric pressure, precipitation, wind direction, and other meteorological observations between 1806 and 1830 at his home in Tottenham and his chemical laboratories in Plaistow and Stratford. From the data collected at these sites at the outskirts of London, Howard produced a singularly extensive archive of data.[35] This work of observing and experiencing climate exceeded his own capacities—requiring the labor and expertise of his wife, Mariabella, his son Robert, and many assistants to produce this uninterrupted record.[36] In these efforts, Howard was joined by a large community of weather watchers and record keepers in Britain and beyond, who published the results of their observations in monthly magazines. Howard's tabular archive formed the basis for *The Climate of London*, the first two volumes of which

appeared in 1818 and 1820, with a revised three-volume edition in 1833. The majority of *The Climate of London* is taken up by hundreds of tables of Howard's data (Fig. 5), alongside short periodic descriptions of the weather and clippings that collected, in a fairly unsystematic way, information about weather across the globe taken from newspapers and journals.[37] Against the seemingly unwieldy chaos of the archive, Howard hoped that these "facts . . . properly arranged, would form [a] *history*" of the city's climate—a history constructed through a tabular arrangement of information.[38] This model of numerate history, Howard hoped, would in part argue for the unchanging permanence of England's climate, positioned against contemporary concerns that it was cooling.[39]



58 TABLE CLXXXIII.

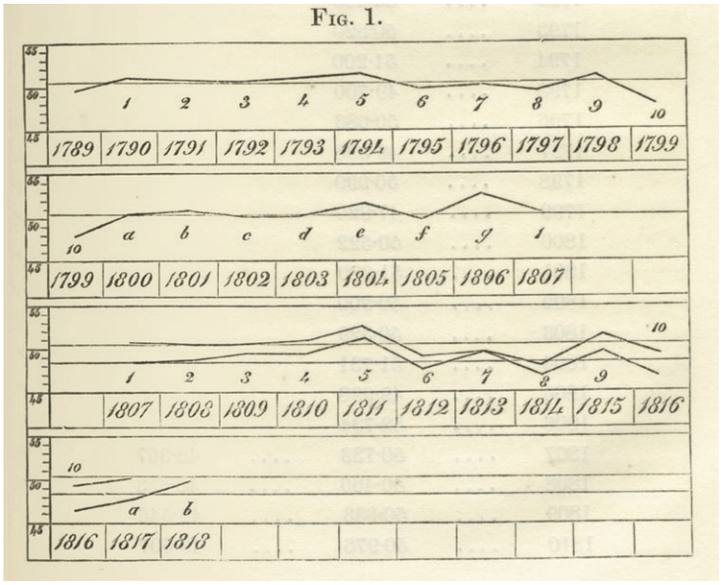
1821.		Wind.	By Clock.		Temp.		T. No. 2.		Evap.	Hygr. at 9 a. m.	Rain, &c.
			Max.	Min.	Max.	Min.	Max.	Min.			
8th mo. Aug.	1	SW	30·08	29·85	74°	52°	76°	51°	—	94	
	2	SW	30·07	30·07	78	56	82	57	—	84	11
	3	E	30·07	30·04	76	52	81	53	—	84	
	4	S	30·04	29·80	78	50			45	82	
	5	S	29·92	29·50	84	53	83	55	—	74	
	6	NW	29·95	29·82	76	52	78	52	—	83	
	7	NW	29·97	29·80	71	51	75	49	—	77	5
	8	SW	29·80	29·40	66	56	68	59	45	94	36
	9	NW	29·45	29·40	70	52	72	50	—	84	
	10	SW	29·55	29·39	67	52	69	50	—	76	
	11	NW	29·86	29·55	68	45	73	44	47	78	9
	12	NW	29·93	29·87	71	49	75	47	—	75	
	13	SW	29·92	29·60	74	57	76	58	—	81	11
	14	W	29·90	29·60	68	48	71	49	—		16
	15	N	30·03	29·90	74	60	75	61	—	90	
	16	W	30·12	30·00	76	61			45	90	
	17	NW	30·12	29·97	75	60	77	60	—	87	
	18	NW	30·17	30·05	73	46			—	92	
	19	S	30·20	30·17	75	45	77	48	—	85	
	20	E	30·20	30·15	79	45	81	48	43	79	
	21	E	30·15	30·12	83	51	85	55	—	82	
	22	NE	30·14	30·05	78	53	80	57	—	96	
	23	NE	30·04	29·90	78	54	80	56	—	86	
	24	SE	29·88	29·87	83	56	85	54	51	88	
	25	NW	29·97	29·87	84	55	84	56	—	91	9
	26	NE	30·12	29·97	74	54	79	55	—	81	—
New M.	27	E	30·12	29·90	63	56	65	54	—	79	2
	28	E	29·90	29·70	60	52			—	80	30
	29	E	29·70	29·66	65	56	63	57	—		77
	30	SW	29·67	29·60	77	59	79	60	—		3
	31	SW	29·85	29·64	75	60	76	61	43		7
			30·20	29·39	84	45			3·19		2·16

5 "Table CLXXXIII" (August 1–31, 1821), from Luke Howard, *The Climate of London,* vol. 3, London, 1833, p. 58 (artwork in the public domain; image provided by Yale University Library, New Haven, CT)

What should art history make of an object such as a table filled with numbers? In his work on nineteenth-century Arctic travel narratives, Benjamin Morgan has argued that tables of meteorological information constitute an "aesthetics of data"—aesthetic in the sense that they document negotiations between bodies, instruments, and environments, between the "narrative" knowledge of the body and the "tabulated" knowledge of science.[40] The figures of the table, read for their textual signification, do embody such sensory knowledge. But as a form of visual representation, we might follow Howard, who described the tables as the "parts of a dissected map"—a collocation that would seem to resist any form of "design," as he called it, or of narrativity.[41] Figures of pure succession and paratactic accumulation, the tables confront the reader with a cascading and proliferating array of numbers. The visual effect that they produce, at least in their successive display in *The Climate of London*, is of overwhelming repetition and the excess of registration. Upon their publication in *The Climate of London*, Howard's tables joined what one reviewer of *The Climate of London* called simply, and somewhat derisively, an "immense mass of meteorological facts."[42] Such information still awaited proper analysis, perhaps because of the absence of a properly vivid or useful form of representation—one that would be required for Howard's analysis of London's climate.

Howard's work of observation in *The Climate of London* was performed in curious opposition to the city itself. As mentioned above, his measurements had been taken at his laboratories and home situated in London's expanding semisuburban periphery. This displacement of location was crucial to his project of identifying the "norm" of the city's climate. When tabulating his results, he turned to the registers kept by the Royal Society at Somerset House, at the very heart of London, to compare and ratify his own data.[43] In the process, he found that "the temperature of the city has been hitherto rated too high" by a factor of two degrees. Howard described the discordance by claiming that the climate of the "*mean of the Latitude and level* of London"—that is, the position the city occupies in abstract cartographic space—is two degrees cooler than "that of the *Metropolis itself*." Thus he concludes that "the temperature of the *city* is not to be considered as that of the *climate*: it partakes too much of an artificial warmth, induced by its structure, by a crowded population and the consumption of great quantities of fuel."[44] Howard was far from the first observer to perceive London's overwhelming atmospheric pollution, but he was the first to precisely measure the excessive heat engendered by its density.[45] He did acknowledge the embodied experience of circulation through the city's heated atmosphere: how one could sense how the "vertical surfaces" or "skreens" of its architecture both reflected and radiated the heat they received.[46] Yet his analysis rests upon numerate data and calculation, not upon the test of such bodily feeling.

To communicate this finding—and to draw meaning out of his "mass" of facts—he turned again to a graph (Fig. 6): this time one that demonstrates, in the lower two registers of the chart, the discrepant average temperatures recorded in his and the Royal Society's registers. In separating the temperature of the city from the climate of the landscape in which it is set, Howard's graph effectively produces London and its envelope of heated air as pathological—an aberrant object that has displaced the "norm" of the climate that Howard's data aims to establish. As noted above, in the 1820s, in Canguilhem's account, the coconstituted concepts of the "normal" and the "pathological" took hold in French medical discourse.[47] Howard's pursuit of the corrected "norm" of London's atmosphere occurred within the context of other projects of identifying abnormality and risk—what Hacking has called an "avalanche of printed numbers" that emerged from the increasingly statistical forms of information gathering in the 1820s.[48] Such "printed numbers," to which Howard's weekly published tables of meteorological data belong, increasingly concerned the status of subjects in their social and political matrices. In this sense, the numerate knowledge of the "modern fact" and the normal state it attempted to construct was a central instrument of nineteenth-century disciplinary culture.

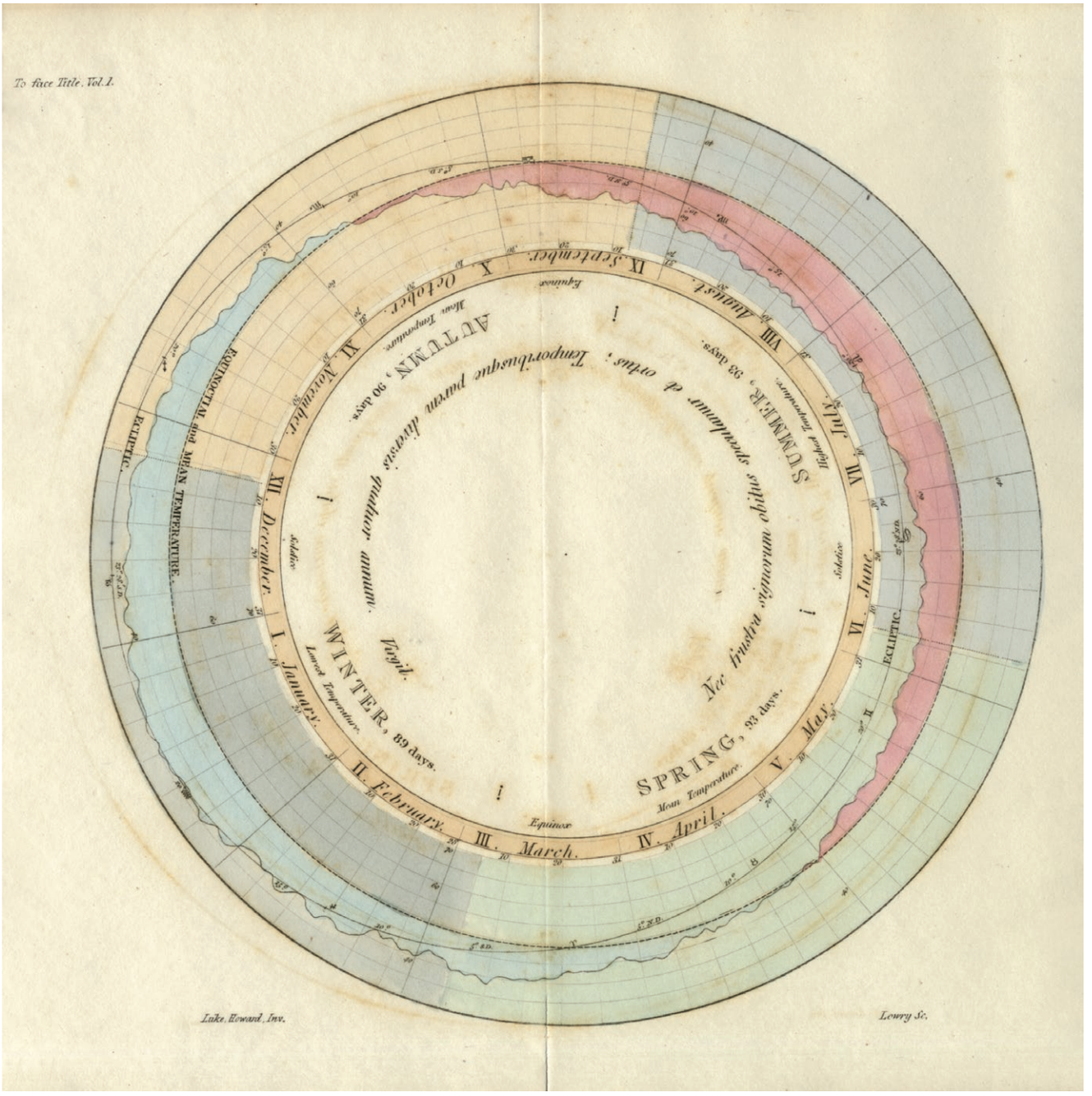


6 Chart of the variation of the annual mean temperature, 1789–1818, from Luke Howard, *The Climate of London*, vol. 1, London, 1820, p. 5 (artwork in the public domain; image provided by Yale University Library, New Haven, CT)

The liberal social order of Britain increasingly shifted to modes of representing the nation's populations in numerate form—both in the national census, inaugurated in 1801, and in records produced by local public and private institutions. The emergence of the modern industrial city was central to such a perceptual shift in which persons became enumerated populations.[49] In response to London's concentrated registration of the fractious, rapidly expanding industrial and imperial world, urban forms of discipline produced, as D. A. Miller puts it, a "perceptual grid in which a division between the normal and the deviant inherently imposes itself."[50] Such biopolitical concerns were central to this era's thinking about climate, understood to be a force that shaped the health of society and as something that could be "improved" in order to better shore up the power of the nation-state and the empire.[51] Thus Howard's "mass" of data met the "avalanche" of disciplinary social data keeping.

This tracking of "pathologies" internal to Britain took place, as Saree Makdisi has argued, as part of a broader process of remaking England into a "Western" and homogenous nation.[52] In racially stratified formations, England's temperate, variable climate would be described by Howard and others as the force that produced the intellect and industry of its inhabitants, endowed by climate with "vigour" and "mental energy," as against the "listless animal enjoyment" engendered by the "*sameness*" of the climates of Africa and Asia.[53] England's climate was thus positioned as a force that underpinned the freedom, industry, and self-determination of its inhabitants against the supposed monotony of the "torrid zone" and other colonial climates. While it would not be until later in the century that meteorological observation became knitted into ideologies of the precision and expert control exercised by the imperial state, Howard was at this point involved in the forming of the Meteorological Society of London, which aimed to foster networks and model the "requisite precision" for the wide gathering of meteorological data, including in Britain's empire.[54] It was against differently pathologized colonial landscapes and populations that the temperate, English landscape and population could be secured and ratified as "normal."

While these political and social projects of normalization would later encompass visual representations of data, Howard attempted early on to give aesthetic presence to the



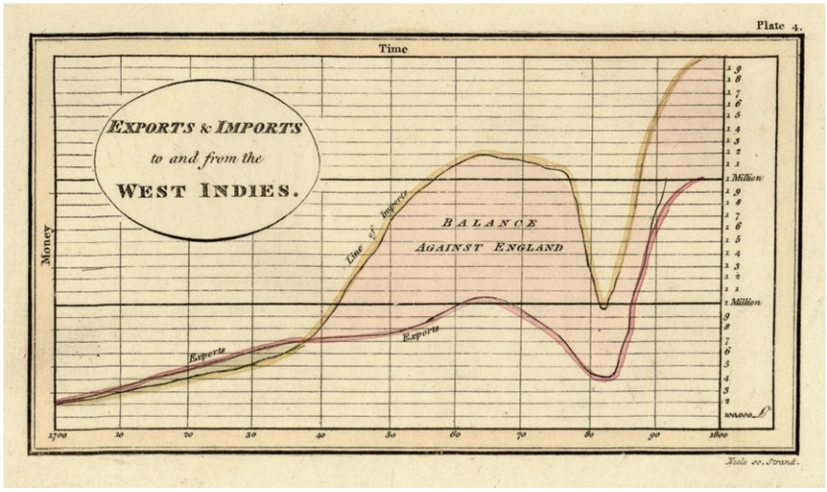
7 "Yearly Cycle of Temp.," from Luke Howard, *The Climate of London*, vol. 1, London, 1833, frontispiece (artwork in the public domain; image provided by Yale University Library, New Haven, CT).

reality of the "norm" through his experiments with graphs, which he called "curves." These curves, which he deemed the most "intelligible language" for the circulation of meteorological information, reduced the "mass" of data into a form that recorded only deviations from an average state.[55] As such, they provided an aesthetic form in which any deviance from meteorological norms would (in Miller's words) "inherently impos[e] itself," as in the chart used by Howard to demonstrate London's abnormally heated atmosphere. By smoothing all of those fragments of observation and experience out into something closer to a coherent plot, the curve gave visual expression to the long duration of data's accumulation, turning it toward something more akin to what Morgan calls the "narrative" knowledge of the body.[56]

Though Howard experimented widely with his approaches to curves and charts of many kinds, his most ambitious invention would be the circular chart that served as the frontispiece to *The Climate of London* (Fig. 7). This hand-colored engraving records the average daily temperature of London across an annual period, plotted against a consistent yearly mean. Warmer and colder periods are marked off in blue and red, while the four seasons are

likewise each denoted with their own color. In this image, we see a disjunctive meeting point between two notions of time and environment. One is the traditional, classical division of the year into the seasons—signaled by Howard's inclusion, at the center of the graph, of a quotation from Virgil's *Georgics* concerning temporal cyclicality as it structured agricultural labor.[57] The other is the abstract time of Howard's "norm"—the thick dotted line at the center of the gridded circle that denotes London's average annual temperature—that is self-same, unchanging, and unyielding to annual cyclicality.

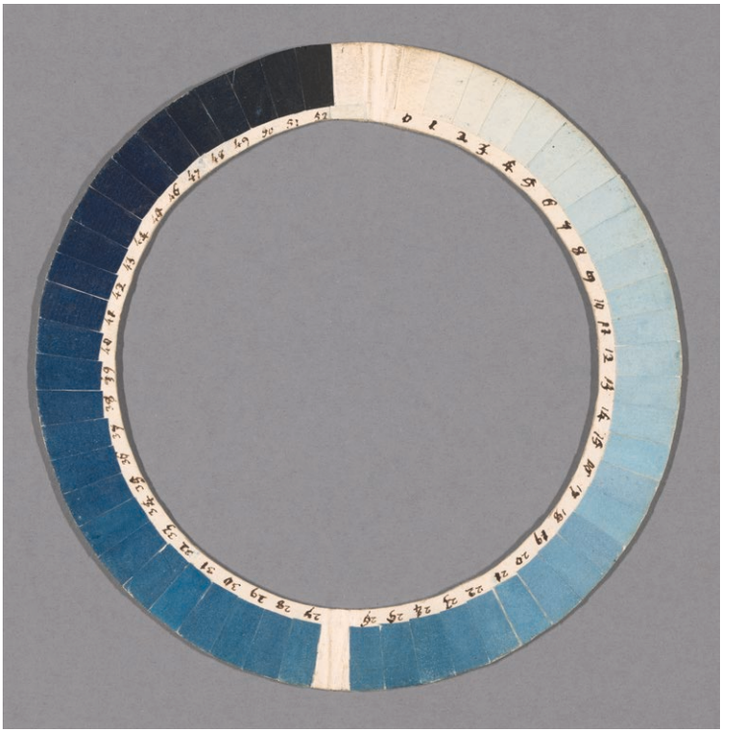
Howard's experiments in graphic representation likely drew upon well-known earlier examples, such as the scientist and radical politician Joseph Priestley's famous 1769 "New Chart of History," which staged a comparative synchronic account of world history, or William Playfair's influential charts of Britain's international trade deficits from the 1780s (Fig. 8).[58] Yet unlike these models built along axes of temporal progression, Howard's model of London's "norm" collapsed twelve years into one averaged graphic space, which does not correspond to any particular moment in time, but rather to an enclosed and abstract present. In this way, it stages an aesthetic experience of what Tobias Menely has called the "cumulative" time of climate—one that charges instantaneous apprehension with a sense of stability and historical accumulation.[59] Such temporal address sharpened the approach of earlier models, like Gilbert White's celebrated account of a local English landscape, his *Natural History of Selborne* of 1789, which, as Alan Bewell argues, bodies forth a myth of "English nature" as permanent, existing always in the "present tense."[60]



8 "Imports and Exports to and from the West Indies," from William Playfair, *The Commercial and Political Atlas*, 3rd ed., London, 1801, pl. 4 (artwork in the public domain; image provided by archive.org)

It was in this circular chart that a visual language of climate—one founded on the displacement of London's aberrant heat—could be staged as a seamless expression of layered temporal duration. Howard's pages and pages of numbers and facts, themselves constituting almost two decades of observation, are reencoded in a wobbly line, enclosed by the chart's hypnotic circular shape. To Howard, this chart expressed a "beautiful System of temperatures": "the four seasons, divided according to their natural limits, ascend and descend in the scale of warmth by equal proportions:—a System resulting indeed from observation alone, but approaching perhaps as nearly to the boasted precision of Mathematical science."[61] Only in this visual form could meteorology's alliance to the numerate order of the "modern fact" be apprehended. Yet he would also describe the graph as a cartographic landscape of heat—a "*Map* on which are marked the boundaries of *the heat and cold of the year*," with the central line, indicating the mean annual temperature, deemed the "*Equator*."[62] Howard thus imagined this graph not only as a meeting place between older and newer understandings of time but also as a reenvisioning of landscape as produced through a graphic aesthetic of data. In this view, the representation of London's climate takes on the holistic thickness of what John Tresch has termed "cosmograms."[63] In doing so, it represents the "temperate," balanced climate of London and, by extension, England as a permanent, self-regulating, and encompassing system.

This cosmological, circular form of Howard's graph demands further interpretation. On the one hand it would seem, in the image's deeply temporal register, to relate a different notion of the eternal present—that of English "work-discipline," a regimentation of laboring bodies embodied by the clockface.[64] Indeed, the chart's shape likely derived from the barograph clock that Howard purchased in 1814, which, through a self-registering mechanism concealed in the clock, produced a circular, annual paper record of data the instrument



9 Alexander Cumming (casework possibly by Thomas Chippendale), barograph clock, 1766, brass, glass, ivory, mercury, paper, silver plate, steel, and mahogany, 11½ × 85¾ × 24¾ in. (29 × 218 × 63 cm). Science Museum, London (artwork in the public domain; photograph provided by Sotheby's)

10 Horace Bénédict de Saussure, cyanometer, ca. 1790, paper, ink, and dye, diameter 7¼ in. (18.3 cm). Bibliothèque de Genève, Geneva, Switzerland, Arch. de Saussure 66/7, pièce 8 (artwork in the public domain; photograph provided by Bibliothèque de Genève, Geneva)

collected (Fig. 9). Self-registering instruments represented the passage of sensory data into graphed knowledge without human intervention or feeling.[65] But perhaps that interpretation would appear too deterministic. And so we should also consider how Howard's graph, despite its alliance with the instrument's anesthetic apprehension of climate, might also turn upon a formal structure available to feeling. Howard's circular graph is visually and functionally analogous to the cyanometer (Fig. 10), an instrument invented by the Swiss naturalist Horace Bénédict de Saussure to measure the blueness of the sky and which is illustrated, though not employed, in *The Climate of London*.[66] Held between the eye of the observer and the sky, the cyanometer exists in suspension between the world of phenomena and the world of data, placing a numerate screen of knowledge between the body and the world. Yet the instrument also addresses itself precisely to the body's momentary sensation—to the forms of feeling that undergirded even the most disciplined, precise modes of observation and experience.[67] Howard's averaged, self-enclosed representation of the normal climate thus reserved a place, even in a submerged or analogical form, for embodied, undisciplined sensation.

CONSTABLE'S CLIMATE

The year after Howard published the first volume of *The Climate of London* in 1818, John Constable began to exhibit his series of "six-footers" at the Royal Academy's annual exhibition at Somerset House. This set of ambitious paintings followed on Constable's move to London in 1817, after which point, as Andrew Hemingway puts it, his "real field of campaign becomes the exhibition room and not the fields of Suffolk."[68] Howard had imagined his book on climate as a series of "facts which, properly arranged, would form [a] *history*," and we likewise need to see Constable's landscape paintings, as Gillen D'Arcy Wood has shown, as possessing a deep historicity, particularly when seen in from the present vantage of climate change.[69] They present in paint "facts . . . properly arranged" (to use Howard's language) that compress

the span of the artist's own stored-up perceptual experience of the Stour Valley landscape of his childhood—a landscape that by this point Constable had left behind. As his friend and biographer C. R. Leslie wrote in 1845, within the "narrowest bounds" of geography that Constable's paintings represented, he was able to achieve his advantageous "knowledge of atmospheric effects" by "a constant study of the same objects under every change of the seasons, and of the times of day."[70] This acquisition of knowledge constitutes at least one function of his famous oil sketches of clouds and other subjects. They served to encase and preserve the experiences of such "constant study," a kind of sensory history that could be drawn upon, though not necessarily replicated, in his finished canvases.[71] In this sense, they are different from more traditional preparatory sketches or studies, which recorded objects or compositions that would be transposed into the finished work.[72] Instead, the particularity of the sky or the trees that populate Constable's studies disappeared into the aggregate form of his finished canvases, which were often not topographically precise but found coherence through their historical, "cumulative" presentation of Constable's observations.

Such attention to the historicity of Constable's landscape paintings both converges with and reframes the established view of his paintings' temporal displacement. As shown in the authoritative accounts of John Barrell, Ann Bermingham, Michael Rosenthal, and others, Constable's exhibition landscapes presented a peaceable vision of rural labor that was being violently contested in the early 1820s.[73] Many of his landscapes represented the property of his father, Golding Constable, whether agricultural fields, grain mills, or the canal transport infrastructure he superintended. If Constable sought to construct the fiction of a "well-regulated community" (in Barrell's terms) of landscape and labor in his paintings, which were (for Bermingham) a symbolic vehicle for "managing" the workers and worked landscapes of his family's properties, this was inseparably subtended by his "well-regulated" arrangement of natural elements recorded in his decades of observation and oil sketching.[74] This regulatory naturalism was the foundation for, and inseparable from, the distanced and disciplinary forms of perception that the social history of art has associated with his six-footers. In order to understand how Constable's paintings presented a repressive view of England's social order in the 1820s, we must also understand how the distantiated aesthetics of climate—with its aggregated means of representing natural order—shaped his vision of England's landscape.

The "well-regulated" nature of the six-footers has produced, in the modernist reception of Constable's painting, a form of disappointment that he did not retain the flowing, expressive brushwork of the sketches in his finished paintings.[75] This is particularly the case with the full-size sketches that Constable produced for his six-footers, which constitute a significant anomaly in the history of art. It is difficult to discern why he would go through the trouble and expense of producing such works, which were never intended to be presented to the public, instead of scaling up from smaller studies. Consider the progression from the full-size sketch to the finished, regulatory "arrangement" of *The Hay Wain*, first exhibited at the Royal Academy in 1821 under the title *Landscape: Noon*.[76] In the full-size oil sketch (Fig. 11), Constable lays out the spatial and narrative elements of the painting: the wide spread of the canalized River Stour, the pictorial anchor of the cottage and trees at left, the hay cart poised in the middle of the river's crossing, and the agricultural fields beyond. All of this is rendered in rapid, mobile facture. In the exhibited version (Fig. 12), this mobility has been contained within Constable's much more minute brushwork, each element of the sketch strained, as though through a sieve, into properly constituted, "refined" knowledge.[77]

This disciplined restraint is the aim of Constable's finished canvases.[78] Here, accumulated fragments of observation and experience find their place within a self-contained whole—what one early historian of Constable's work called an "aggregate of circumstances."[79]

11 John Constable, full-scale study for *The Hay Wain*, 1821, oil on canvas, 54 × 74 in. (137 × 188 cm). Victoria and Albert Museum, London (artwork in the public domain; photograph © Victoria and Albert Museum, London)

The scumbled surface of the sketch and its frankly flattened sky has been replaced by a deeply recessional space and a voluminous matrix of elements—what one critic in 1821 described as a "volume of cloud and clear light."[80] The canvas, in this view, is not a surface of painterly experiment, but rather a container of stored-up matter. The spatialized depth is redoubled within the painting's depth of time, figured in the slow motion of the hay cart. Immersed in liquid materiality, the cart's movement is captured by the barely rippling volume of water that produces the sensation of an infinitely slowed-down duration or what Karl Kroeber calls a "*passage*."[81] The cart is shown in the process of turning, just as the day, pictured as the original title insists at noon, is itself at a hinge that gathers together temporal spans that precede and follow.[82] The iconography of haymaking in turn refers the painting outward to a system of weather watching that sought to understanding the turn of the seasons and the climate of a given place, against which the timing of haymaking (as Howard and others wrote) had to be intricately timed.[83] If the painting refers to any given moment, it is thus one that seems to stretch outward into a permanent existence.[84]

In this temporal address of *The Hay Wain*, Constable marks his subtle but decisive difference from the British landscape painters that preceded him. It is here we can see the shift from the "ideal landscape" of the eighteenth century to the "normal landscape" of the nineteenth. Constable's art was, in part, an iconoclastic reaction to a British landscape tradition, exemplified by Richard Wilson (Fig. 13), which transposed both the pictorial formulas and the golden atmospheric glow of Claude Lorrain's landscapes onto British soil—even as

12 John Constable, *The Hay Wain* (*Landscape: Noon*), 1821, oil on canvas, 51¼ × 73 in. (130.2 × 185.4 cm). National Gallery, London (artwork in the public domain; photograph © National Gallery, London/Art Resource, NY)

13 Richard Wilson, *View near Wynnstay, the Seat of Sir Watkin Williams-Wynn, fourth Bt.*, 1770–71, oil on canvas, 71 × 96⅜ in. (180.3 × 244.8 cm). Yale Center for British Art, New Haven, CT (artwork in the public domain; photograph provided by Yale Center for British Art)

Constable professed himself to be deeply indebted to that tradition.[85] This earlier conception of the "ideal landscape"—connected here to the warmth of an Italian climate—was conjoined in Joshua Reynolds's *Discourses* with the aspiration of art toward nature's "ideal beauty, superior to what is to be found in individual nature." Yet this ideality was founded on an aspiration to understand nature more deeply, a paradox never fully resolved by Reynolds or his successors.[86] The opposite of Claudian ideality was embodied in the Dutch tradition of landscape painting, understood by Reynolds to be overly concerned with the mutely particular, untranscended, and base material of the world.[87]

What changed in Constable's naturalism in the 1820s—in his "normal landscapes"—was that it conflated the particular and the ideal. In this way, his paintings offered a very different aesthetic embodiment of an average form, one founded on empirical observation, even as it represents a state that is unavailable to the human sensorium. He would later articulate this as the desire to give "'to one brief moment caught from fleeting time,' a lasting and sober existence."[88] Hazlitt's attempts in the 1820s to come to terms with Reynolds's theories provide perhaps the most precise language for this recombination. He placed two of Constable's artistic heroes—Peter Paul Rubens and Rembrandt—under the category of artists concerned with "that *which is*," with "the individual." Claude, perhaps the painter Constable most revered, would on the other hand represent "the *ideal* . . . that which we wish any thing to be, and to contemplate without measure and without end."[89] Constable's paintings allowed "that *which is*" to attain the appearance of permanence, to be "contemplate[d] . . . without end." More importantly, it was a mode of ideality in which the link to the actuality of the natural world was never severed, given the succession of sketches that underpinned them.[90] Thus, while sharing the enthusiasm for the immediacy of oil sketching with painters such as John Linnell and William Mulready, Constable's finished, composite landscapes presented an altogether different model of sensation and attenuated particularity. The concept of climate mirrors and shapes such sensation: it is a concept that is never actually experienced except as abstraction, yet it retains its claim upon the conditions of lived, particular reality.

In turn, Constable repositioned the accumulated "facts" of his landscape paintings as normative claims. "But why should not subjects purely English be made the vehicle of General Landscape?" he would ask in 1832.[91] In this formulation, the "particular"—England's climate—is offered as the "ideal" or "General," as the normative measure of landscape. The aesthetic claim of his "normal landscape" thus becomes a political claim, too, one concerning not only his distance from the realities of rural life and labor in the 1820s but also his relation to a global geography defined by empire, one in which England is positioned as central and normative. Constable was also participating in the shift that Kay Dian Kriz has tracked in the decades around 1800, when British painters such as Augustus Wall Callcott came to represent the notion of a particular English "genius"—formed by England's climate itself—for representing a more truthful, common nature, in distinction to the artificial "glitter" of French painting and to the generalized principles of Italianate painting.[92]

Yet even as his paintings aimed to express such attenuated temporal compression—one that captured the "General" permanence of the English climate—Constable would begin to finish the surface of the canvas with markers of momentary, material presence. Here, I refer to the spots of pure white pigment distributed across his paintings' surfaces, figuring dew and reflection but also serving, as Bermingham has suggested, as signs of "feeling."[93] This technique, known colloquially as "Constable's snow," was inaugurated with *The Hay Wain* and soon became the most notorious feature of Constable's paintings, characterized by one critic in 1821 as a "piebald scambling [*sic*]."[94] The momentary shimmer and visual sparkle embodied in this white pigment body forth the "freshness" and "dew" of England's climate

that Constable hoped to capture, indexing its healthful, vivifying nature.[95] Yet "freshness" also has a temporal register. Like the dew that is the momentary and ephemeral deposition of moisture, "freshness" connotes something immanent and markedly impermanent. Constable's spots of white pigment thus figure one limit point of his attempts to represent the "sober" permanence of England's atmosphere. Repeated over successive canvases surveying the same landscape, his Stour Valley exhibition paintings aspire to represent an aggregate that would yet retain some element of immediacy, to give the slower perception of climate a sense of immediate material presence.

This "freshness" was particularly important for Constable to register within the exhibition spaces of London. The "piebald scambling" of his painted surfaces, which was seen to work against his carefully calibrated naturalism, reflected the painter's anxiety about the integrity of his canvases as they were transported across space, and especially as they entered into the "pathological" urban environment.[96] As the conservator Sarah Cove has shown, Constable consciously intensified the white brightness of his paintings, believing that that they would be altered and darkened over time by what he called the "impure," "sulpheretted" climate of London.[97] One critic described Constable's "glittering white speckly effects" as calibrated against the way paintings "yield to the damps and dullness of our climate."[98] In attempting to enclose the surfaces of his paintings against transformation by the urban climate, he attempted to fix the "Englishness" of the landscapes they represented. Yet this operation also meant that the climate of London itself was, in essence, already present in his defensive deposition of Suffolk's "dews" across the surface of the canvas.[99]

PAINTING OVER PATHOLOGY

Constable had an ambivalent, even phobic relationship to London. Beginning in 1819 he had begun to spend part of his time in Hampstead, a village perched at London's expanding suburban environs that had been made newly accessible in the early decades of the nineteenth century by expanding transportation and communication networks.[100] If the density of cultural and material capital in London had drawn Constable there, the environmental corollary of that density—the city's insalubrious, "sulpheretted" air—precipitated his family's move to Hampstead on behalf of his ailing wife, Maria. Yet, as observers frequently noted, the smoky efflorescence of London's microclimate often invaded Hampstead and the city's urban periphery.[101] Even still, from this peripheral vantage, Constable found in Hampstead the possibility of living in London, while abjuring it: as he wrote in 1823, "though I am here in the midst of the world I am out of it—and am happy—and endeavour to keep myself unspoiled."[102] Like Howard, whose position at the suburban fringes of the city allowed his observations to remain "unspoiled" by the artificially heated urban atmosphere, Constable's suburban position afforded him both proximity and innocence—an "unspoiled," or as his biographer Leslie mistranscribed it, "unspotted," sensibility.[103]

Constable consciously positioned the "freshness" of his paintings against London's atmosphere and its exhibition halls, as well as the paintings produced to satisfy its demands. He would express this opposition in the language of purity and pathology. He particularly disdained the yellowed, darkened, varnished paint surfaces of landscape paintings that imitated the time-altered surfaces of old-master paintings.[104] Those paintings were favored by collectors such as Constable's friend George Beaumont and those whom the painter called the "manufacturers of pictures"—aligning them with a commercial, even industrial class, as against his rural self-affiliation.[105] Writing in 1822, he described finishing a painting by "griming it down with slime & soot" given that the painting's eventual owner "is a connoisseur and of course prefers filth & dirt, to freshness & beauty."[106] The "filth & dirt" of the painted

surface, to recall Constable's "unspoiled" condition, might be seen as the direct corollary to the coal-smoked atmosphere of the city, from which his thickly deposited white "dew" aimed to protect the interior volume of light and air. This language of environmental pathology—which would also extend to Constable's disdain for the political radicals living in what he called the "slimy marshes" of the city—transits between his perceptions of environment, society, and painting itself.[107]

It was at the Royal Academy exhibitions at Somerset House, the most prestigious venue in London for public exhibition, where such "freshness & beauty" would be put to the test. As Bermingham has argued, landscape painting in the early nineteenth century increasingly had to contend with the spectacular, chromatically intense visuality of urban spectacles, such as the panorama, in order to assert themselves within the crowded visual atmosphere of the Royal Academy's exhibitions (Fig. 14). Yet Constable's paintings regularly failed to compete with the flashier works of J. M. W. Turner or John Martin.[108] Indeed, Constable's more self-enclosed paintings came under direct threat in the space of the exhibition. As his friend John Fisher wrote in 1821, it was difficult to see *The Hay Wain* correctly in the academy's galleries: "how can one participate in a scene of fresh water & deep noon day shade in the crowded copal atmosphere of the Exhibition[?]"[109] Here, we must perceive the space of the metropolitan exhibition itself as a kind of artificial climate that exerted a sustained influence upon the paintings made to be displayed within it. Writing of Somerset House's galleries in 1820, another critic described the "glare" and "heat" of the rooms, which was compounded by what Hazlitt would describe as "the merciless splendour of the painter's pallet [*sic*] [that] puts nature out of countenance . . . in the wide dazzling waste of colour."[110] (Recall that Somerset House was also the site of the Royal Society's inaccurately high readings of London's mean temperature.) In Somerset House's institutional, metropolitan space, which crossed the domains of art and science, we can locate an artificial sensory atmosphere that was understood as potentially confounding nature's normal "countenance"—one that deranged the perceptibility of Constable's carefully, slowly accumulated embodiments of England's "climate of more than vernal freshness."

14 George Scharf, *Exhibition at the Royal Academy*, 1828, watercolor, 7½ × 10¼ in. (18.9 × 26 cm). Museum of London (artwork in the public domain; photograph © Museum of London)

15 John Constable, *Waterloo Bridge from Whitehall Stairs* (study for *The Opening of Waterloo Bridge*), ca. 1819, oil on millboard, 11½ × 19 in. (29.2 × 48.3 cm). Victoria and Albert Museum, London (artwork in the public domain; photograph © Victoria and Albert Museum, London)

Yet the entire enterprise of Constable's six-footers was haunted, more directly, by London: that is, by the tortured progress of the painter's *The Opening of Waterloo Bridge*. This painting was to be his only large-scale representation of London, which he began to paint in 1819 but which he finished and exhibited only in 1832 after an uncharacteristically long period of struggle. In this painting, he directly confronts the illegible, dislocating climate of industrial modernity. The painting depicted the ceremonial opening of Waterloo Bridge, designed by John Rennie and named after Britain's decisive victory in the Napoleonic wars two years earlier. It had been inaugurated on June 18, 1817, to great fanfare, with a procession of the prince regent and the lord mayor down the Thames. Constable had made a series of sketches in pencil, ink, and oil for *Waterloo Bridge*, such as an early oil study (ca. 1819; Fig. 15). This esquisse established the basic spatial structure of the painting: the departure

of the blaring ceremonial barges in the foreground, moving up the Thames, which sweeps along the canvas's right-hand side, leading to the bridge itself that stretches across the horizon. While many other artists and illustrators also produced works marking the occasion, Constable's decision to begin a painting on this subject in 1819 was peculiar—not only because it was slightly belated, but also because it required him to contend with the very heart of London's urban landscape and a complicated figural program alien to his practice.[111]

During the painting's long and difficult gestation, Constable's paintings of the Stour Valley would often be produced and shown in place of his painting of London's unregulatable climate. By the fall of 1820, he was preparing to finish *Waterloo Bridge* in time for the Royal Academy exhibition the next spring. But he abandoned this plan—and decided that winter to paint and exhibit *The Hay Wain* instead.[112] That painting curiously almost replicates the spatial structure of Constable's planned *Waterloo Bridge.* Anchored at left by a mass of trees and buildings, both paintings exhibit a deep, planar recessional space that curves backward to the horizon. In *The Hay Wain*, as it stood in for *Waterloo Bridge* at the Royal Academy exhibition, the fields of Suffolk are laid over the Thames, and the humble hay cart replaces the bombastic ceremonial barge.

16 John Constable, *The Cornfield*, 1826, oil on canvas, 56¼ × 48 in. (143 × 122 cm). National Gallery, London (artwork in the public domain; photograph © National Gallery, London/Art Resource, NY)

Yet he did not completely abandon his plans for the picture he called his "London." When he finally returned to the painting in 1824 and 1825, the experience of attempting to confront the urban landscape caused him increasing anxiety.[113] In his account of his progress on the work, the process seems to have turned harrowing. The painting, he wrote in a letter that November, "like a blister begins to stick closer and closer—& to disturb my nights," as if emitting pathological miasmatic exhalations.[114] If the atmosphere of London seemed to threaten the integrity of his paintings, in the process of working on *Waterloo Bridge* that influence seemed to exert itself upon the body of the painter himself. And so, in 1825, he abandoned the painting again. In place of this second attempt, he exhibited *The Cornfield* at the Royal Academy in 1826 (Fig. 16). He wrote to John Fisher that the painting's subject was animated by a "pleasant and healthfull [*sic*] breeze—*'at noon.'*"[115] This attempt to materialize and inhabit a "healthfull breeze" was one response to the pathological atmosphere of London. Indeed, *The Cornfield* is perhaps his most complete and forceful vision of England's climate as salutary, enduring, and present.[116]

Persisting through the political turbulence of the 1820s, the death of his wife in 1828, and the debates leading up to the passing of the Reform Bill in June 1832 (the landmark electoral reform, to which Constable was deeply opposed), the development of *Waterloo Bridge* coincided with a series of personal and political losses. Such struggles inflected Constable's defensive attempt to condense London's atmospheric flux into one material object and "orderly arrangement" of facts, as his Stour Valley canvases had.[117] When it was finally

17 John Constable, *The Opening of Waterloo Bridge* (*Whitehall Stairs, June 18th, 1817*), 1829–32, oil on canvas, 51½ × 85⅞ in. (130.8 × 218 cm). Tate, London (artwork in the public domain; photograph © Tate)

completed and shown in 1832, Constable's *Waterloo Bridge* (Fig. 17) evinced neither England's "climate of more than vernal freshness" nor the stable, temporally dilated process of accumulated sensation staged in *The Hay Wain*.[118] Rather, the painting verges on dissolution into an illegible mass of paint: the foreground buildings are crowded with clotted figures; the surface of the Thames is almost obliterated by streaks of white paint; the eye's passage along the river, toward the bridges in the distance, is blocked by rows of black barges. Instead of luminous and fresh, the painting was perceived by many critics as thick, base, and occluded, described as a "piece of plaster" or a "shower of whitewash," the painting "rough and course" and spoiled "by sprinkling white spots all over the canvass," which were "smeared about to the utter ruin of the picture."[119] Here we might see, as Hubert Damisch suggests, the "pathological ('senseless') character" often ascribed to paintings that "allo[w] the sensible (material) components of painted images to prevail over [their] truly iconic components."[120] Damisch's comment—which builds directly on Canguilhem's study—helps us to understand how Constable's loss of control over paint related to the breakdown of the structured perception of environmental systems to which his art aspired. Instead of being legible as stable information and representing the body's belonging in space, the painting threatened to revert to nonsignifying and semantically unlocatable materiality.

The unregulated nature of *Waterloo Bridge* is most evident in his treatment of the metropolis's sky. Here, Constable's usual methods for defining and delimiting aerial space—as in the volumetric, mobile atmosphere of *Stratford Mill* and *The Hay Wain* (see Figs. 3, 12)—do not cohere. The lower half of the painting is rendered in an almost fanatically minute manner. But the undisciplined painterly language of the sketch seems to overtake the sky. This half of the painting presents an almost undivided mass of white and gray tones, gathered in

rippled and punctuated planes that fail to express volume or mobility, presenting instead a confused disarray of uncoordinated data. Howard had captured this multidirectional, oppressive quality of London's humanmade heat ("continually poured into the common mass from the chimnies" and "diffused in all directions") in *The Climate of London*.[121] While streams of light and falling rain appear to descend from a central cloud to the river below, inserting a circulatory force, this movement is countervailed by slashes of white impasto that play illogically over the rest of the sky, producing a kind of stagnant putridity associated with unhealthy climates.[122] At right, alongside a munitions-producing shot tower, stand the smokestacks of factories that send out lurid blots of darkened smoke.[123] An errant cloud hangs from the bridge itself—the emission of a ceremonial cannon fire. This pairing of the shot tower and the burst of gun smoke inserts an "abnatural" environmental cycle at the painting's center.[124] And so, rather than the systematic exchange of heat and moisture between the ground and sky tracked in *The Hay Wain*'s dew and voluminous clouds, *Waterloo Bridge* stages instead the altered ecologies of the military and imperial state.

18 J. M. W. Turner, *Shadrach, Meshach and Abednego in the Burning Fiery Furnace*, 1832, oil on mahogany, 36⅛ × 28⅞ in. (91.8 × 70.8 cm). Tate, London (artwork in the public domain; photograph © Tate)

Constable's representation of the intense, dissolving force of London's climate found a counterpart in the galleries of Somerset House itself. Hanging in the same room as Constable's painting was one of J. M. W. Turner's offerings for the 1832 exhibition, his *Shadrach, Meshach and Abednego in the Burning Fiery Furnace* (Fig. 18).[125] This biblical narrative of bodies that remain unconsumed by the flames also suggests the heated worlds of the metropolis and the industrial factory, a heat that fuses body and environment together in a hazy mass.[126] One reviewer, who found *Waterloo Bridge* "watery and threatening," wrote that Turner's canvas was "judiciously placed by the hanging committee opposite [Constable's], in order to prevent the room from becoming damp"[127] We can see here, again, how the space of Somerset House itself was perceived as an artificial climate engendered by the relationship between paintings, emphasizing their environmental relation to one another. While Turner's painting stages, almost excessively, the bodily sensorium's survival of such intense feeling, Constable's painting suggests the breakdown both of the body's disciplined perceptual capacities and of the systems of the environment itself. While Howard was able, by means of his graphic language, to retain the separateness of his own calculated "norm" from the "pathological" heat of London, in *Waterloo Bridge* such separation was impossible. Rather, as Constable's progress on this painting suggests, his representations of England's "normal" climate were haunted by the unperceivable system of London's atmosphere and its threatening, transforming effects.

As Raymond Williams writes, the "crowded variety" and "randomness of movement" of nineteenth-century London did in fact "embod[y] a system"—but it was a "positive system of differentiation, in law, power and financial control," one that was often illegible at the level of lived experience.[128] London was the seat of the state institutions and private bodies developing the forms of data gathering, statistics, and disciplinary perception central to both

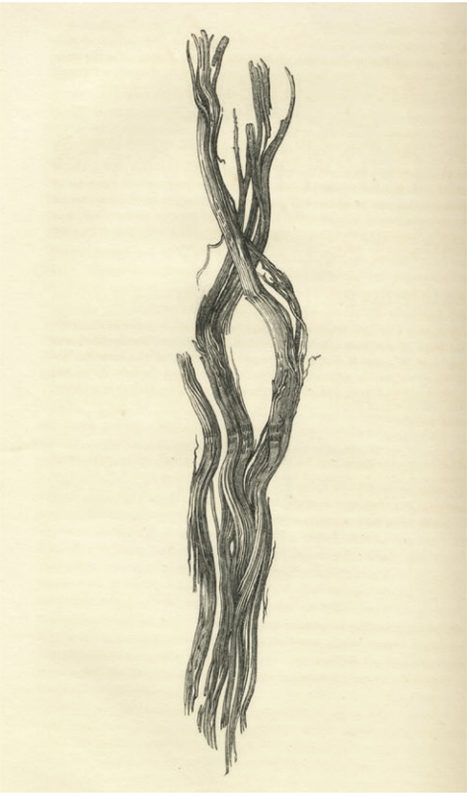
the emergence of the nineteenth-century regime of the "normal" and the development of a modern, global observation of climate. Not least among these significant sites was Somerset House, located at the very center of *Waterloo Bridge*. This was the home not only of the Royal Academy (the painting's eventual destination) and the Royal Society (the origin of the artificially elevated temperature readings Howard sought to correct). It also housed the Navy Board (and the Navy's meteorological data-gathering projects) and the Stamp and Tax Offices (collector of duties and taxes).[129] Eventually, it would house the Registrar General of Births, Marriages, and Deaths, which published its collection of data on the nation's population alongside a continuous meteorological register under the superintendence of James Glaisher.[130] Which is to say, the apparatus of knowledge production and administration, the "positive system of differentiation" that would so vigorously pursue the "normal" state of society in the nineteenth century, was, obliquely, a subject at the center of Constable's canvas. In this sense, Constable's *Waterloo Bridge* stages the recursive nature of the aesthetics of climate in the nineteenth century: the very institutions and ways of knowing that would develop an aggregated, objectified means of perceiving the world were also, in time, responsible for producing the atmosphere it recorded.

ESTRANGEMENT

Understanding how an aesthetics of the "normal" climate emerged—and how feeling and aesthetic experience might be reinvented to represent it—has been the aim of my discussions here. It should perhaps go without saying that this particular way of understanding the environment is significant because it has been with and against this aesthetics of the "normal" that the bewildering scale of what we now call climate change could be understood. Already by the 1840s, the influential Prussian meteorologist Heinrich Wilhelm Dove would describe the global distribution of "normal temperatures" as well as (in this case, natural) causes for what he termed "thermic anomaly."[131] The concept of a "climatological normal"—an average established from thirty years of data, much like Howard's—has been used by climatologists since the early twentieth century for both comparative and predictive purposes.[132]

Yet this designation of an arbitrarily fixed and static normality has been problematic for the progress of research on anthropogenic climate change. Indeed, in Canguilhem's account, the nineteenth-century regime of normality tended to disallow an understanding of norms as dynamic and fluid, rather than fixed.[133] In his essay on the concept of the "milieu," Canguilhem considers instead a form of human life that is not in opposition to its environment but that "extends itself yet . . . is also almost gentle in its flexibility."[134] At points, both Constable and Howard would stage the strain entailed by such a fixed or "permanent" atmospheric norm, envisioning instead forms of responsive immersion. Such response and immediacy might be seen in the figure of the drinking boy in Constable's *The Cornfield* (Fig. 19), which is set apart in its dramatic pose from many of his figures. Hiking his arms up in order to press his body, almost desperately, away from the sky toward the ground, he dips his face to the stream to drink, as if to break through from the painting's attenuated moment into liquid immediacy. Though almost all of Constable's exhibition landscape paintings include figures, they tend to disappear from view in their critical reception, both in the artist's time and in ours, except as figures of "estrangement."[135] Such estrangement can, in light of climate, be understood not just as a psychosocial or political phenomenon but also as an environmental one: the estrangement of experience from processes of constructing climate and the environment as a known, calculated object.[136] The drinking boy in *The Cornfield* mounts his own resistance to this estrangement—staging the desire to turn away from the world of managed labor and return, through painting, to Constable's imagined experience of his "careless boyhood"—to the domain of feeling.[137]

This figure also points to a significant departure between Constable's and Howard's projects. As Bermingham describes, Constable would increasingly turn in the exhibition paintings of the late 1820s and 1830s, as in his *Hadleigh Castle* (1829; Yale Center for British Art), to a looser form of painting, in which a more dramatic representation of weather effects seems to signal Constable's own subjective presence.[138] If such a move constituted the abandonment of his painstaking mode of coordinated sensation in works like *The Hay Wain*, it was also the abandonment of the distanced aesthetics of climate upon which he had earlier staked his career. Howard, conversely, would continue to ally his research increasingly with the mechanical ideal of the self-registering instrument, as in his 1847 *Barometrographia*, which collected a set of circular engraved charts from his barometric clock.[139] Yet perhaps, despite his emphasis on the ordered arrangement of feeling, Howard too might be seen to express his own dissatisfaction with such disciplined perception. In the only full-page illustration included in his expanded 1833 *Climate of London*, an engraving of a length of wood struck by lightning interrupts the endless flow of text, tables, and charts (Fig. 20). Transformed by its contact with the electric air, this wood offers up a surrogate figure of immersion and responsivity.



19 John Constable, *The Cornfield* (Fig. 16), detail (artwork in the public domain; photograph © National Gallery, London/Art Resource, NY)

20 "Effects of Lightning on Trees," from Luke Howard, *The Climate of London*, vol. 2, London, 1833, opp. p. 161. Yale University Library, New Haven, CT (artwork in the public domain; image provided by Yale University Library, New Haven, CT)

If Howard's classified clouds were indices of the energetic electrical flows of the atmosphere, the flash-formed, twisted length of wood emerges from the pages of *The Climate of London* as a very different kind of atmospheric electrical registration.[140] On the one hand, it seems a surrogate for a body, like Constable's boy, transformed by its encounter with the environment. On the other, in its strange resemblance to a scientific instrument, the lighting-struck wood suggests in its own odd way how instruments had overtaken the human sensorium as a site of knowledge, both in Howard's work and in a broader disciplining of scientific observation. "The *sky* too belongs to the Landscape," Howard wrote: "the ocean of air in which we live and move . . . can never be to the zealous Naturalist a subject of tame and unfeeling contemplation."[141] But to produce a system that could capture the system of climate in its duration, it was to the nonmimetic, seemingly "unfeeling" language of line and chart to which Howard had to turn. And so, like Constable's drinking boy, this length of wood suggests in its own curious way the dilemmas of an environment increasingly known and imagined only through the world of instruments, data, tables, and charts. In its own structures of perceptual discipline, the aesthetic of climate produced its own forms of estrangement.

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NOTES

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1. William Hazlitt, "On the Fine Arts" (1824), in *Criticisms on Art; and Sketches of the Picture Galleries of England* (London: John Templeton, 1843), 191. Here, Hazlitt is in fact speaking of painted atmospheres in the work of Claude Lorrain.

2. Ron Broglio has discussed the parallel nature of Constable's and Luke Howard's cloud observations, focusing on how they "shared a *similarity in thought*" rather than focusing on influence: see Broglio, *Technologies of the Picturesque: British Art, Poetry, and Instruments, 1750–1830* (Lewisburg, PA: Bucknell University Press, 2008), 129–58 (emphasis in original). Gillen D'Arcy Wood has argued that, in the context of the present climate crisis, we can look to Constable's cloud studies and their sense of transience as a means to understand his deep investment in "the representation of reality as a historical process," a phrase he borrows from Karl Kroeber. See Wood, "Constable, Clouds, Climate Change," *Wordsworth Circle* 38, nos. 1–2 (2007): 27. Wood's provocative and wide-ranging account of Constable's cloud studies and oil paintings converges in many points with mine. However, we come to different conclusions about the relationship between the sketches and the finished paintings, and his account aims more explicitly to consider how the artist's paintings might be seen from the current vantage of climate change, in which the studies function as "critiques" of the "georgic stability" of works like *The Hay Wain*, and indeed as proleptic visualizations of climate change itself. My argument proceeds from the view that the cloud studies are in fact subsumed within the exhibition paintings, which themselves contain critiques of the "stability" they purport to represent.

3. For this understanding of the nature of observation in this moment, I rely on Lorraine Daston, "The Empire of Observation, 1600–1800," in *Histories of Scientific Observation,* ed. Daston and Elizabeth Lunbeck (Chicago: University of Chicago Press, 2011), 81–113. On Constable's inscriptions and the painter's representation of temporal duration, see Broglio, *Technologies of the Picturesque*, 138–40; and Timothy Wilcox, "Keeping Time: Clouds and Chronometry in Constable's Major Landscapes," in *Constable's Clouds: Paintings and Cloud Studies by John Constable*, ed. Edward Morris, exh. cat. (Edinburgh: National Galleries of Scotland; Liverpool, UK: National Museums and Galleries on Merseyside, 2000), 161–69.

4. For a sustained and rich account of another, later painter's engagement with weather, language, symbol, and data, see Rachael Z. DeLue, *Arthur Dove: Always Connect* (Chicago: University of Chicago Press, 2016), 83–146. On a twentieth-century aesthetics of data—or what Orit Halpern terms "infrastructures of sense and knowledge"—see Halpern, *Beautiful Data: A History of Vision and Reason since 1945* (Durham, NC: Duke University Press, 2015). On the history and construction of "data" in climate science, see Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge, MA: MIT Press, 2010).

5. For influential discussions of ecological crisis and problems of scale, see Bruno Latour, "Agency at the Time of the Anthropocene," *New Literary History* 45, no. 1 (2014): 1–18; and Dipesh Chakrabarty, "The Climate of History: Four Theses," *Critical Inquiry* 35, no. 2 (Winter 2009): 197–222. Timothy Morton's exploration of the "hyperobject"—his term for objects that are "massively distributed in time and space relative to humans"—has been influential in this respect, in that climate change is offered as one such "hyperobject" that challenges conventional modes of perception and philosophical thought. See Morton, *Hyperobjects: Philosophy and Ecology after the End of the World* (Minneapolis: University of Minnesota Press, 2013), 1. A recent essay on Luke Howard's work, published after this essay was mostly completed, has taken temporal scale as a key element of Howard's efforts to smooth out climatic aberrance: see Alexis Harley, "Domesticating Climate: Scale and the Meteorology of Luke Howard," in *Romantic Climates: Literature and Science in an Age of Catastrophe*, ed. Anne Collett and Olivia Murphy (Cham, Switzerland: Springer Nature, 2019), 17–31.

6. See, for example, Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Cambridge, MA: Harvard University Press, 2011).

7. This conversation was inaugurated by Kurt Badt in *John Constable's Clouds* (London: Routledge & Kegan Paul, 1950), which argued for the decisive effect Howard's work had on Constable's "skying." Badt's view was countered by a more biographical and pragmatic reading in Louis Hawes, "Constable's Sky Sketches," *Journal of the Warburg and Courtauld Institutes* 32 (1969): 344–65. John E. Thornes, a meteorologist, undertook a sustained study of Constable's cloud studies in relation to Howard's observations and other meteorological knowledge; see Thornes, *John Constable's Skies: A Fusion of Art and Science* (Birmingham, UK: University of Birmingham Press, 1999). For a critical historiography, see Anne Lyles, "'The Glorious Pageantry of Heaven': An Assessment of the Motives behind Constable's 'Skying,'" in *Constable's Skies*, ed. Frederic Bancroft, exh. cat. (New York: Salander-O'Reilly Galleries, 2004), 29–54; and Wood, "Constable, Clouds, Climate Change." See also Morris, *Constable's Clouds*; Bancroft, *Constable's Skies*; and Ray Lambert, *John Constable and the Theory of Landscape Painting* (Cambridge: Cambridge University Press, 2005), 70–80. For an important, related account of Constable's scientific knowledge, see Paul D. Schweizer, "John Constable, Rainbow Science, and English Color Theory," *Art Bulletin* 64, no. 3 (September 1982): 424–45. For a thorough and insightful critical biography of Howard, focusing on his cloud classifications, see Richard Hamblyn, *The Invention of Clouds: How an Amateur Meteorologist Forged the Language of the Skies* (2001; New York: Picador, 2002).

8. See Wood, "Constable, Clouds, Climate Change," 27. I share Ann Bermingham's assessment of the debate about whether Constable's studies were primarily "romantic" or "naturalistic" (i.e., scientific): namely, that both accounts assume a transparent relationship between art and nature: see Bermingham, "Reading Constable," *Art History* 10, no. 1 (March 1987): 38–58. Bermingham argues that Constable's widely available letters have (perhaps intentionally) overdetermined the reading of his work, for which reason this article aims to engage with, while putting critical pressure upon, the artist's letters as forms of evidence about his intentions.

9. Lorraine Daston, "Epistemic Images," in *Vision and Its Instruments: Art, Science, and Technology in Early Modern Europe*, ed. Alina Payne (University Park, PA: Penn State University Press, 2015), 13–35. In Daston's definition, the "epistemic image earns its name by translating abstract epistemological priorities into concrete pictures," usually as a result of "synthetic perception, of composites forged by memory and judgment," 18–19. On the subject of meteorological images in particular, including a discussion of Howard, see Daston's "Cloud Physiognomy," *Representations* 135, no. 1 (2016): 45–71.

10. John Constable, "The Letterpress to *English Landscape*" (ca. 1833), in *John Constable's Discourses*, ed. R. B. Beckett (Ipswich, UK: Suffolk Records Society, 1970), 9.

11. John Constable, "Lectures on Landscape" (1836), in ibid., 69. Wood points to Constable's statement, and his crossing of art and science, as a model for a present-day "disciplinary anxiety" about the persistent division between science and the humanities; Wood, "Constable, Clouds, Climate Change," 33.

12. See especially: Vladimir Janković, *Reading the Skies: A Cultural History of English Weather, 1650–1820* (Chicago: University of Chicago Press, 2000); *Intimate Universality: Local and Global Themes in the History of Weather and Climate*, ed. James Rodger Fleming, Vladimir Janković, and Deborah R. Coen (Sagamore Beach, MA: Science History Publications, 2006); Jan Golinski, *British Weather and the Climate of Enlightenment* (Chicago: University of Chicago Press, 2007); *Osiris*, vol. 26, *Klima*, ed. James Rodger Fleming and Vladimir Janković (Chicago: University of Chicago Press, 2011); and Deborah R. Coen, *Climate in Motion*: *Science, Empire, and the Problem of Scale* (Chicago: University of Chicago Press, 2018).

13. Key exceptions from the history of science include Coen, *Climate in Motion*; Jennifer Tucker, *Nature Exposed: Photography as Eyewitness in Victorian Science* (Baltimore: Johns Hopkins University Press, 2005), 126–58; and Katharine Anderson, "Looking at the Sky: The Visual Context of Victorian Meteorology," *British Journal for the History of Science* 36, no. 3 (September 2003): 301–22. Mark Monmonier provides an incisive overview

of meteorological mapping in his *Air Apparent: How Meteorologists Learned to Map, Predict, and Dramatize Weather* (Chicago: University of Chicago Press, 1999). On air as a medium of aesthesis, climate, and attendant questions of estrangement, see Eva Horn, "Air as Medium," *Grey Room* 73 (Fall 2018): 6–25. Birgit Schneider's consideration of "meteorological aesthetics," focused on the German context, considers some of the same issues of aesthesis, sensation, and graphic representation addressed here: Schneider, "Feeling, Measuring, Perceiving: On Meteorological Aesthetics in Art and Science," in *Mary und der Vulkan: Eine Meteorologische Phantasmagorie* (Düsseldorf, Germany: rhein verlag studio, 2016), 49–57.

14. See the classic account in Charles N. Rosen and Henri Zerner, "Romanticism: The Permanent Revolution," in *Romanticism and Realism: The Mythology of Nineteenth-Century Art* (New York: Viking Press, 1984), 9–48. For recent accounts that differently emphasize the dynamics and aesthetics of wholeness in Romantic science and literature, see John Tresch, *The Romantic Machine: Utopian Science and Technology after Napoleon* (Chicago: University of Chicago Press, 2012); and Amanda Jo Goldstein, *Sweet Science: Romantic Materialism and the New Logics of Life* (Chicago: University of Chicago Press, 2017).

15. Luke Howard, *The Climate of London, Deduced from Meteorological Observations, Made at Different Places in the Neighborhood of the Metropolis*, vol. 1 (London, 1818), xxxv (emphasis in original). I will be primarily citing the first two volumes of *The Climate of London*; the first was published in 1818, the second in 1820. A revised, expanded, and reordered three-volume edition was published in 1833.

16. In a related account of *The Hay Wain* (1821), Karl Kroeber saw Constable's painting as producing a mobile but unified image of "life processes" that allow the painting to achieve a kind of "temporality": see Kroeber, *Romantic Landscape Vision: Constable and Wordsworth* (Madison: University of Wisconsin Press, 1975), 19–25. See also the focus on temporal duration in Broglio, *Technologies of the Picturesque*, 129–58.

17. See *John Constable's Correspondence,* ed. R. B. Beckett (Ipswich, UK: Suffolk Records Society, 1962–68), 4:417, cited in Graham Reynolds, *The Later Paintings and Drawings of John Constable*, vol. 1 (New Haven, CT: Yale University Press, 1984), 43–44.

18. John Constable to John Fisher, October 23, 1821, in Beckett, *John Constable's Correspondence*, 6:78. In rethinking what "feeling" might mean for Constable's art, I am following on Bermingham's analysis of how the painter's recourse to the "language of the heart" in his letters has tended to predetermine the analysis of his paintings and their "naturalism"; see Bermingham, "Reading Constable."

19. Constable, "Lectures on Landscape," in Beckett, *John Constable's Discourses*, 69 (emphasis in original).

20. For example, Howard writes that to "mention the differing warmths of day and night, or of the different months of the year, is simply to appeal to the test of feeling," which only provides a "vague comparison with past sensations." Howard, *The Climate of London*, vol. 2 (London, 1820), 89. The body's "*feeling*" or sensation of climate was, more broadly, "comparative, depending on previous sensations": Luke Howard, *Seven Lectures on Meteorology*, 2nd ed. (1837; London: Harvey and Darton, 1843), 32–33 (emphasis in original). On Howard in the context of an examination of climate and Enlightenment theories of "sensibility" and the sensory experience of weather, see Golinski, *Climate of Enlightenment*, esp. 137–69. On the distrust and discipline of the senses in nineteenth-century scientific practice, see Lorraine Daston and Peter Galison, *Objectivity* (Brooklyn: Zone Books, 2007).

21. Bruno Latour, "Drawing Things Together," in *Representation in Scientific Practice*, ed. Michael Lynch and Steve Woolgar (Cambridge, MA: MIT Press, 1990), 19–68.

22. Howard, *The Climate of London,* vol. 1 (1818), xxxvi.

23. See, among a vast literature, Theodore M. Porter, *The Rise of Statistical Thinking* (Princeton, NJ: Princeton University Press, 1986); and Ian Hacking, "Biopower and the Avalanche of Printed Numbers," *Humanities in Society* 5 (1982): 279–95.

24. See O. B. Sheynin, "On the History of the Statistical Method in Meteorology," *Archive for History of Exact Sciences* 31, no. 1 (1984): 56–95.

25. Georges Canguilhem, *The Normal and the Pathological*, trans. Carolyn R. Fawcett (1966; Brooklyn: Zone Books, 1991). See also Ian Hacking, *The Taming of Chance* (Cambridge: Cambridge University Press, 1990), 160–69.

26. Luke Howard, "On a Periodical Variation of the Barometer, Apparently Due to the Influence of the Sun and Moon on the Atmosphere," *Philosophical Magazine* 7, no. 28 (September 1800), 355–63.

27. As Susan Faye Cannon argues, the graph was central to Humboldtian science: it is "difficult for us to remember just how novel graphs were in the 1820s, especially as real tools in science." See Cannon, *Science in Culture: The Early Victorian Period* (New York: Science History Publications, 1978), 95. On the history of graphic representations of scientific data, see, among others: H. Gray Funkhouser, "Historical Development of the Graphical Representation of Statistical Data," *Osiris* 3 (1937): 269–404; Laura Tilling, "Early Experimental Graphs," *British Journal for the History of Science* 8, no. 3 (1975): 193–213; James R. Beniger and Dorothy L. Robyn, "Quantitative Graphics in Statistics: A Brief History," *American Statistician* 32, no. 1 (February 1978): 1–11; Thomas L. Hankins and Robert J. Silverman, *Instruments and the Imagination* (Princeton, NJ: Princeton University Press, 1995), 113–47; Thomas L. Hankins, "Blood, Dirt, and Nomograms: A Particular History of Graphs," *Isis* 90 (1999): 50–80; and Klaus Hentschel, *Visual Cultures in Science and Technology: A Comparative History* (Oxford: Oxford University Press, 2014), 47–51.

28. Beniger and Robyn, "Quantitative Graphics in Statistics," 7–8.

29. For Howard's biography and background, see Hamblyn, *The Invention of Clouds.* Other key sources include: "A Luke Howard Miscellany: Compiled by His Great Grandson, Bernard Howard" (typescript, 1959), Library of the Society of Friends, London, 092.3.H72; and "Autobiography of Luke Howard" (ca. 1840), Library of the Society of Friends, London, MS BOX 5/2.

30. Howard's essay, "On the Modifications of Clouds, and on the Principles of Their Production, Suspension, and Destruction [. . .]," was published in three parts in the *Philosophical Magazine* in July, September, and October 1803; it was then republished as a book and in many editions and compilations thereafter. For a full account of Howard's involvement in the Askesian Society and his work on his essay on clouds, see Hamblyn, *The Invention of Clouds*, esp. 62–89, 112–40. Constable likely knew of Howard's classifications (at least by the 1830s) because of the discussion of them in Thomas Forster's *Researches about Atmospheric Phaenomena* (London, 1813), 1–40. On Constable's engagement with Forster's book, see Thornes, *John Constable's Skies*, 68–80. For recent accounts of Howard's essay on "modifications," see Marjorie Levinson, "Of Being Numerous," *Studies in Romanticism* 49, no. 4 (Winter 2010): esp. 643–44; Thomas H. Ford, *Wordsworth and the Poetics of Air: Atmospheric Romanticism in a Time of Climate Change* (Cambridge: Cambridge University Press, 2018), 97–107; and Harley, "Domesticating Climate," 24–27. On Howard's illustrations for his essay and its later editions and his engagements with scientific convention, see Boris Jardine, "Made Real: Artifice and Accuracy in Nineteenth-Century Scientific Illustration," *Science Museum Group Journal* 2 (Autumn 2014), https://doi.org/10.15180/140208.

31. See Howard's manuscript barometer readings, dated 1798: Royal Meteorological Society Archives, National Meteorological Library & Archive, Exeter, UK, MET/2/1/2/3/251 (hereafter cited as RMSA).

32. The grid printed on the original material substrate of the paper itself shaped Howard's investigation of the relation of barometric pressure to lunar orbits; because the tabular form had already included the moon's phases, Howard "began to suspect a coincidence between [lunar phases] and the course of the barometer." Howard, "On a Periodical Variation of the Barometer," 357. His interest in the moon's effect on atmospheric pressure was shared by many meteorologists and would persist through the nineteenth century: see Sheynin, "On the History of the Statistical Method," 56–62; and Katharine Anderson, *Predicting the Weather: Victorians and the Science of Meteorology* (Chicago: University of Chicago Press, 2005), 46–55.

33. Mary Poovey, *A History of the Modern Fact: Problems of Knowledge in the Sciences of Wealth and Society* (Chicago: University of Chicago Press, 1998).

34. On the epistemological functions of the table, see Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (1966; New York: Vintage Books, 1994), esp. 307–12; and Daston and Galison, *Objectivity*.

35. See the eight volumes of Howard's "Meteorological Journals," RMSA, MET/2/1/2/3/250 and MET/2/1/2/3/251. Howard's meteorological registers were originally published in monthly magazines such as the *Annals of Philosophy* and the *Athenaeum* alongside those of other weather watchers.

36. On Mariabella Howard's participation in Howard's observations, see "A Luke Howard Miscellany," 101.

37. On the ways in which news of the weather mediated distant events during a time of increasing geographic displacement and violence—with particular attention to

Howard's inclusion of clippings about global weather—see Mary Favret, *War at a Distance*: *Romanticism and the Making of Modern Wartime* (Princeton, NJ: Princeton University Press, 2010), 119–44.

38. Howard, *The Climate of London*, vol. 1 (1818), iv (emphasis in original).

39. Howard, *The Climate of London*, vol. 2 (1820), iv–v. On Howard's insistence on climate's uniformity and permanence, see also Harley, "Domesticating Climate," esp. 27–29.

40. Benjamin Morgan, "After the Arctic Sublime," *New Literary History* 47, no. 1 (Winter 2016): 1–26, esp. 14.

41. Howard, *The Climate of London,* vol. 1 (1818), xxxv.

42. "On Meteorology, Meteorological Instruments, and the Climate of London," *British Review* 17, no. 34 (June 1821): 337.

43. See the set of tables that repeatedly averaged, reduced, and compared his and the Royal Society's measurements: RMSA, MET/2/1/2/3/251. On the history of the Royal Society's meteorological registers, see Richard Cornes, "The Barometer Measurements of the Royal Society of London: 1774–1842," *Weather* 63, no. 8 (August 2008): 230–35.

44. Howard, *The Climate of London,* vol. 2 (1820), 90, 93, 91 (emphasis in original).

45. Howard is considered the first to record and represent what is now known as an "urban heat island"; see Gerald Mills, "Luke Howard and *The Climate of London*," *Weather* 63, no. 6 (June 2008): 153–57.

46. Howard, *The Climate of London,* vol. 2 (1820), 107.

47. Canguilhem, *Normal and the Pathological*; and Hacking, *Taming of Chance*. For a revision of this history, which only sees a later emergence of disciplinary "normality," see Elizabeth Stephens and P. M. Cryle, *Normality: A Critical Genealogy* (Chicago: University of Chicago Press, 2017). For an illuminating explication of and response to Canguilhem's text, see Michael Warner, *The Trouble with Normal: Sex, Politics, and the Ethics of Queer Life* (Cambridge, MA: Harvard University Press, 1999). It should be noted that Canguilhem makes it clear that the French physiologists, such as Claude Bernard, who are the protagonists of his story abjured numerical data and averages in their pursuit of the "normal" human physiological system, preferring to shore up the expert perception and judgment of the medical profession. But in the observational and physical sciences numerate data was the very grounding of its status as a science (as Canguilhem discusses in the case of statistician Adolphe Quetelet). As such, in these contexts numerate averages took precedence over the trained perception of the expert. See Canguilhem, *Normal and the Pathological,* 151–79.

48. Hacking, "Biopower and the Avalanche of Numbers," 279–95.

49. Patrick Joyce, *The Rule of Freedom: Liberalism and the Modern City* (London: Verso, 2003), 24–34. On tables, population statistics, and weather records in the eighteenth century, see Andrea Rusnock, *Vital Accounts: Quantifying Health and Population in Eighteenth-Century England and France* (Cambridge: Cambridge University Press, 2002), 15–41, 110–36. See also Poovey, *Modern Fact*, 264–306.

50. D. A. Miller, *The Novel and the Police* (Berkeley: University of California Press, 1988), 18. As Miller writes, the aim of such disciplinary regulation is "to enforce not so much a norm as the normality of normativeness itself."

51. Fabien Locher and Jean-Baptiste Fressoz, "Modernity's Frail Climate: A Climate History of Environmental Reflexivity," *Critical Inquiry* 38, no. 3 (Spring 2012): 582–83.

52. Saree Makdisi, *Making England Western: Occidentalism, Race, and Imperial Culture* (Chicago: University of Chicago Press, 2014).

53. Howard, *The Climate of London*, vol. 2 (1820), 293 (emphasis in original). On Howard's views on the temperate climate, see Golinski, *Climate of Enlightenment*, 2–3. On the colonial nexus of climate and racial theories, see, for example, Roxann Wheeler, *The Complexion of Race: Categories of Difference in Eighteenth-Century British Culture* (Philadelphia: University of Pennsylvania Press, 2000). As a Quaker, Howard was a committed abolitionist and campaigner for literacy and religious education in Britain's colonies and other territories; the abolition of the slave trade in the British empire on March 25, 1807, and its later anniversaries are the only historical events recorded among his meteorological observations (see *Climate of London*, vol. 1 [1818], table V, note c). This, of course, did not preclude Howard's subscription to hierarchical theories of racial difference. See, for example, the paternalist framework of a tract he wrote as part of his association with the British and Foreign Bible Society: Luke Howard, *A Word to the Sons of Africa* (London, 1822).

54. See J. M. Walker, "The Meteorological Societies of London," *Weather* 48, no. 11 (November 1993): 364–72.

55. Luke Howard, "On the Best Means for Conducting Meteorological Observations in Different Places and Climates, So as to Produce Some Uniformity in the Modes of Obtaining and Summing Up the Results," *Philosophical Magazine* 57, no. 274 (February 1821): 81–83.

56. Morgan, "After the Arctic Sublime," 14; see also Harley, "Domesticating Climate," 17–31.

57. The passage from the first book of Virgil's *Georgics*, "Nec frustra signorum obitus speculamur et ortus / Temporibusque parem diversis quatuor annum," was given in a contemporary translation as "nor is it in vain that we observe the setting and rising of the signs, and the year divided equally into four different seasons." John Martyn, *The Georgicks of Virgil, with an English Translation and Notes*, 3rd ed. (London: Robert Dutton, 1811), 73, lines 257–58. On local weather observation, calendars, and seasonal time in the eighteenth century, see Janković, *Reading the Skies*, 113–20; and Golinski, *Climate of Enlightenment*, 91–98. For Howard's belief in "providential design" and his theories of lunar influence on the "system" that is represented by his circular chart, see Golinski, *Climate of Enlightenment*, 74–76, 104–6; for a discussion of a similarly circular chart based on William and John Herschel's meteorological research, see Anderson, *Predicting the Weather*, 48–51.

58. On Playfair and Priestly, in the context of a broad, enlightening survey of modes of representing historical time, see Anthony Grafton and Daniel Rosenberg, *Cartographies of Time: A History of the Timeline* (New York: Princeton Architectural Press, 2010), esp. 116–43. Many thanks to Richard Taws for bringing this book to my attention.

59. See Tobias Menely, "'The Present Obfuscation': Cowper's *Task* and the Time of Climate Change," *PMLA* 127, no. 3 (May 2012): esp. 483–90. As Menely writes, via Walter Benjamin, it is against this "cumulative" time of climate that the "immediacy of a narrowing instant may be known" (489). Menely's incisive account of poetic confrontations with climate's temporality has shaped my own approach to visual representations of climate.

60. Gilbert White, *The Natural History and Antiquities of Selborne, in the County of Southampton* (London, 1789); and Alan Bewell, *Natures in Translation: Romanticism and Colonial Natural History* (Baltimore: Johns Hopkins University Press, 2017), 159.

61. Howard, *Seven Lectures on Meteorology*, 48, 61–62.

62. Ibid., 48.

63. John Tresch uses this concept to describe ideas, images, or other objects that, in brief, attempt to represent "unification" or holistic worldviews; see Tresch, "Technological World-Pictures: Cosmic Things and Cosmograms," *Isis* 98 (2007): 84–99.

64. E. P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past & Present* 38 (December 1967): 56–97.

65. For a discussion of self-registration, meteorology, and picture making in a different context, see DeLue, *Arthur Dove,* 135–37.

66. *The Climate of London*, vol. 1 (1818), xxvii–xxix.

67. My thinking here is guided by John Tresch's notion of the "romantic machine," in which the instrument and the observer's body are conjoined within a coconstituted knowledge of environmental unity. See Tresch, *The Romantic Machine*. On the cyanometer (in John Ruskin's hands) as mediating between a desire for calculation and the body's own fluctuating "hypersensitivity," see Briony Fer, "Eva Hesse and Color," *October* 119 (Winter 2007): 21.

68. Andrew Hemingway, *Landscape Imagery and Urban Culture in Early Nineteenth-Century Britain* (New Haven, CT: Yale University Press, 1992), 8.

69. Wood, "Constable, Clouds, Climate Change." On Constable's relationship to narrative and history painting, see Ronald Paulson, *Literary Landscape: Turner and Constable* (New Haven, CT: Yale University Press, 1982), esp. 133–39.

70. C. R. Leslie, *Memoirs of the Life of John Constable, Esq. R.A., Composed Chiefly of His Letters* (London: Longman, Brown, Green, and Longmans, 1845), 314–15.

71. In an additional spatial displacement, the most concentrated series of oil sketches focused on the landscape and skies of Hampstead but ostensibly served the depiction of other landscapes—whether the Stour Valley, Salisbury, or the other subjects of Constable's large paintings.

72. On the functions of Constable's oil sketches, see especially Ann Bermingham, *Landscape and Ideology: The English Rustic Tradition, 1740–1860* (Berkeley: University

of California Press, 1986), 126–36; and Wood, "Constable, Clouds, Climate Change."

73. See John Barrell, *The Dark Side of the Landscape: The Rural Poor in English Painting 1730–1840* (Cambridge: Cambridge University Press, 1980); Michael Rosenthal, *John Constable: The Painter and His Landscape* (New Haven, CT: Yale University Press, 1983); Bermingham, *Landscape and Ideology*; Hemingway, *Landscape Imagery and Urban Culture*; Stephen Daniels, *Fields of Vision: Landscape Imagery and National Identity in England and the United States* (Princeton, NJ: Princeton University Press, 1993); and Elizabeth Helsinger, *Rural Scenes and National Representation: Britain, 1815–1860* (Princeton, NJ: Princeton University Press, 1997).

74. Barrell, *Dark Side of the Landscape*, 137; and Bermingham, *Landscape and Ideology,* 136–47.

75. On the reception of Constable's work, see Ian Fleming-Williams and Leslie Parris, *The Discovery of Constable* (New York: Holmes & Meier Publishers, 1984). For a different argument against the modernist reading of his cloud studies, see Wood, "Constable, Clouds, Climate Change."

76. For an overview of the production and reception of *The Hay Wain* and its full-size sketch, see Reynolds, *Later Paintings and Drawings of John Constable*, 1:67–70; Leslie Parris and Ian Fleming-Williams, *Constable*, exh. cat. (London: Tate Gallery, 1991), 203–5; and Franklin Kelly, "The Hay Wain," in *Constable: The Great Landscapes*, ed. Anne Lyles, exh. cat. (London: Tate Publishing, 2006), 140–42.

77. In this way, Constable can be seen as part of an emergent "culture of detail" and of "information" in the nineteenth century that Jennifer Raab has explored through Frederic Church's paintings. See Raab, *Frederic Church: The Art and Science of Detail* (New Haven, CT: Yale University Press, 2015).

78. As discussed in Bermingham, *Landscape and Ideology*, 145–47.

79. C. J. Holmes, *Constable and His Influence on Landscape Painting* (New York: E. P. Dutton and Company; Westminster, UK: Archibald Constable and Company, 1902), 174.

80. R[obert] H[unt], *The Examiner*, May 27, 1821, 331–32, quoted in Judy Crosby Ivy, *Constable and the Critics: 1802–1837* (Woodbridge, UK: Boydell & Brewer for the Suffolk Records Society, 1991), 88.

81. Karl Kroeber, *Romantic Landscape Vision*, 16 (emphasis in original); see also Wood, "Constable, Clouds, Climate Change," 28.

82. On the sky's registration of time, see John Durham Peters, *The Marvelous Clouds: Toward a Philosophy of Elemental Media* (Chicago: University of Chicago Press, 2015), 213–60; in the case of Constable, see Timothy Wilcox, "Keeping Time," in Morris, *Constable's Clouds*, 161–69.

83. Howard, *The Climate of London*, vol. 2 (1820), 303–4. See also Rosenthal, *Constable*, 127–29; and Wood, "Constable, Clouds, Climate Change," 28.

84. On Constable's construction of the visual "stability" of social and economic structures, founded on the "permanence of nature," see Barrell, *Dark Side of the Landscape*, 147–49.

85. See David H. Solkin, *Richard Wilson: The Landscape of Reaction*, exh. cat. (London: Tate Gallery, 1982); and *Richard Wilson and the Transformation of European Landscape Painting*, ed. Martin Postle and Robin Simon, exh. cat. (New Haven, CT: Yale University Press, 2014).

86. Joshua Reynolds, "Discourse III," in *The Works of Sir Joshua Reynolds*, vol. 1 (London: T. Cadell and W. Davies, 1797), 36. On this paradox, see John Barrell, "The Public Prospect and the Private View: The Politics of Taste in Eighteenth-Century Britain," in *Reading Landscape: Country-City-Capital*, ed. Simon Pugh (Manchester, UK: Manchester University Press, 1990), 19–40; see also Iris Wien, "The Opaque Nature of Constable's Naturalism," *RACAR* 41, no. 2 (2016): 53–54.

87. On Constable's earlier work as part of a broader cultural investment in "phenomenalism," or forms of knowledge based on direct experience alone, see Charlotte Klonk, *Science and the Perception of Nature: British Landscape Art in the Late Eighteenth and Early Nineteenth Centuries* (New Haven, CT: Yale University Press, 1996).

88. John Constable, "Letterpress to *English Landscape*," in Beckett, *John Constable's Discourses*, 9–10. Constable is here quoting William Wordsworth's "Upon the Sight of a Beautiful Picture" (1811–15). On this aspect of the temporality of Constable's landscapes in relation to Wordsworth, see Kroeber, *Romantic Landscape Vision*, 3–28; James A. W. Heffernan, "Space and Time in Literature and the Visual Arts," *Soundings: An Interdisciplinary Journal* 70, no. ½ (1987): 95–119; and Broglio, *Technologies of the Picturesque*, 148–53.

89. William Hazlitt, "On the Picturesque and Ideal," in *Table-Talk; or, Original Essays* (London, 1822), 379.

90. While I largely follow Ray Lambert's assessment that Constable's aesthetics were shaped by the longer tradition of English pictorial theory, embodied by Reynolds and "Grand Theory," here I depart by suggesting that the peculiar "naturalism" of Constable's work in the 1820s was not merely a reformulation of the "ideal landscape." See Lambert, *Constable and the Theory of Landscape Painting*, esp. 239–34.

91. Constable, "Draft Prospectus for *English Landscape*" (ca. 1832), in Beckett, *John Constable's Discourses*, 83.

92. Kay Dian Kriz, *The Idea of the English Landscape Painter: Genius as Alibi in the Early Nineteenth Century* (New Haven, CT: Yale University Press, 1997), esp. 33–56, 75–79. 100–103.

93. See Bermingham, "Reading Constable," esp. 51–57; and Bermingham, *Landscape and Ideology*, 134–36, 147–55.

94. *Bell's Weekly Messenger*, May 28, 1821, 165, quoted in Ivy, *Constable and the Critics*, 89.

95. On this quality of Constable's paintings see, among others: Mark Hallett, "1825: Fresh," in *The Royal Academy Summer Exhibition: A Chronicle, 1769–2018*, ed. Hallett, Sarah Victoria Turner, and Jessica Feather (London: Paul Mellon Centre for Studies in British Art, 2018), accessed September 9, 2019, https://chronicle250.com/1825; Peter Bishop, *An Archetypal Constable: National Identity and the Geography of Nostalgia* (London: Athlone, 1995); and Wood, "Constable, Clouds, Climate Change," 31.

96. Here, I follow Jennifer Roberts's provocation to see how geography and pictorial transit "*inhabit*" the making of pictures: see Roberts, *Transporting Visions: The Movement of Images in Early America* (Berkeley: University of California Press, 2014).

97. Sarah Cove, "The Painting Techniques of Constable's 'Six-Footers,'" in Lyles, *The Great Landscapes*, 65.

98. *Library of the Fine Arts*, June 1, 1831, 421, quoted in Ivy, *Constable and the Critics*, 152.

99. I am grateful to Jeremy Melius for discussion of this aspect of Constable's "snow."

100. On these developments, see Elizabeth McKellar, *Landscapes of London: The City, the Country, and the Suburbs, 1660–1840* (New Haven, CT: Yale University Press, 2013).

101. See, for example, the remarks in John James Park, *The Topography and Natural History of Hampstead, in the County of Middlesex* (London, 1814), 75.

102. Constable to Fisher, May 9, 1823, in Beckett, *John Constable's Correspondence*, 6:116.

103. Leslie, *Memoirs of the Life of John Constable,* 109.

104. For a recent account of painters "embracing pictorial change" in the late eighteenth century, see Matthew C. Hunter, "Joshua Reynolds's 'Nice Chymistry': Action and Accident in the 1770s," *Art Bulletin* 97, no. 1 (March 2015): 58–76.

105. Constable to Fisher, December 6, 1822, in Beckett, *John Constable's Correspondence*, 6:107.

106. Ibid., 6:106.

107. Constable to Charles Robert Leslie, late October 1831, in Beckett, *John Constable's Correspondence*, 3:49. My thanks to Tim Barringer for bringing my attention to this letter. On the cultural meanings of marshes and other "wastelands," see Vittoria di Palma, *Wasteland: A History* (New Haven, CT: Yale University Press, 2014).

108. Ann Bermingham, "Landscape-O-Rama: The Exhibition Landscape at Somerset House and the Rise of Popular Landscape Entertainments," in *Art on the Line: The Royal Academy Exhibitions at Somerset House, 1780–1836*, ed. David H. Solkin, exh. cat. (New Haven, CT: Yale University Press, 2001), 127–43. See also Anne Lyles, "Soliciting Attention: Constable, the Royal Academy, and the Critics," in Lyles, *The Great Landscapes*, 32–39. On the broader "ecosystem" of interchange and competition among exhibitionary spaces, with an incisive discussion of *The Hay Wain*, see Catherine Roach, "The Ecosystem of Exhibitions: Venues, Artists, and Audiences in Early Nineteenth-Century London," *British Art Studies* 14 (November 2019), https://doi.org/10.17658/issn.2058-5462/issue-14/croach.

109. Fisher to Constable, July 19, 1821, in Beckett, *John Constable's Correspondence*, 6:70, quoted in Hallett, "Fresh."

110. *London Magazine* 1 (May 1820): 695, quoted in Michael Rosenthal, "Turner Fires a Gun," in Solkin, *Art on the Line*, 155; and Hazlitt, "On the Fine Arts," 236.

111. On the long period of gestation, trial, and error that led to *The Opening of Waterloo Bridge*, see the following

definitive accounts: Reynolds, *Later Paintings and Drawings of John Constable,* 1:34–37, 233–34; Parris and Fleming-Williams, *Constable*, 206–13, 369–72; Anne Lyles, "The Opening of Waterloo Bridge," in Lyles, *The Great Landscapes*, 185–88; Tim Barringer, "Thomas Cole's Journey," in *Thomas Cole's Journey: Atlantic Crossings*, ed. Elizabeth Mankin Kornhauser and Barringer, exh. cat. (New York: Metropolitan Museum of Art, 2018), 39–40, 142–43; and Barringer, entry on *The Opening of Waterloo Bridge*, in *Thomas Cole's Journey*, 171–72.

112. See Constable to Fisher, September 1, 1820, in Beckett, *John Constable's Correspondence*, 6:56; Beckett's note regarding Constable's change of plans, in ibid., 6:59; and Reynolds, *Later Paintings and Drawings of John Constable*, 68.

113. See letters to John Fisher concerning the painting: Constable to Fisher, January 17, 1824, in Beckett, *John Constable's Correspondence* 6:149–50; Constable to Fisher, July 18, 1824, in ibid., 6:167–68; and Constable to Fisher, November 12, 1825, in ibid., 6:206–07.

114. Constable to Fisher, November 19, 1825, in ibid., 6:207.

115. Constable to Fisher, April 8, 1826, in ibid., 6:216 (emphasis in original).

116. On this painting as Constable's turn toward the "picturesque," see Rosenthal, *Constable*, 171–80. On *The Cornfield* and its role in Constable's reputation, see Leslie, *Memoirs of the Life of John Constable*, 293–94; Helsinger, *Rural Scenes and National Representation*, 60–64; and William Vaughan, "Constable's Englishness," *Oxford Art Journal* 19, no. 2 (1996): 17–27. On Constable's later significance for conceptions of national identity, see Daniels, *Fields of Vision,* 200–42; and Alex Potts, "'Constable Country' between the Wars," in *Patriotism: The Making and Unmaking of British National Identity*, ed. Raphael Samuel, vol. 3 (London: Routledge, 1989), 160–86.

117. See Barringer, "Thomas Cole's Journey," 39–40; and Barringer, *Thomas Cole's Journey*, cat. 32, 171–72.

118. John Constable, "Letterpress to *English Landscape*," in Beckett, *John Constable's Discourses*, 9.

119. [Edward Dubois], *Observer*, May 27, 1832, n.p.; *Morning Post*, May 5, 1832, n. p.; *Times*, May 8, 1832; and *Spectator*, May 12, 1832, 450, all quoted in Ivy, *Constable and the Critics*, 158–60. On such critical discourse in the early nineteenth century, see Sam Smiles, "'Splashers,' 'Scrawlers' and 'Plasterers': British Landscape Painting and the Language of Criticism, 1800–1840," *Turner Studies* 10, no. 1 (Summer 1990): 5–11.

120. Hubert Damisch, *A Theory of /Cloud/: Toward a History of Painting*, trans. Janet Lloyd (1972; Stanford: Stanford University Press, 2002), 27.

121. Howard, *The Climate of London,* vol. 2 (1820), 104.

122. On air and health in British environmental discourses, including questions of ventilation and aerial stagnation, see, among others, Vladimir Janković, *Confronting the Climate: British Airs and the Making of Environmental Medicine* (New York: Palgrave Macmillan, 2010), esp. 67–91.

123. As many writers have pointed out, the shot tower in Constable's painting was not built at the time of the 1817 ceremony depicted; it had instead been built in 1826 by Thomas Maltby & Co. I am grateful to Amy Concannon for discussions about *Waterloo Bridge* and her analysis of the intensified presence of pollution as Constable's work on the canvas progressed.

124. I borrow the term "abnatural" from Jesse Oak Taylor, for whom it signals the "experience of dwelling in a manufactured environment." Taylor, *The Sky of Our Manufacture: The London Fog in British Fiction from Dickens to Woolf* (Charlottesville: University of Virginia Press, 2016), 5–6.

125. On this painting, see Martin Butlin and Evelyn Joll, *The Paintings of J. M. W. Turner* (New Haven, CT: Yale University Press, 1977), 179; and Leo Costello, "Power, Creativity, and Destruction in Turner's Fires," *19: Interdisciplinary Studies in the Long Nineteenth Century* 25 (2017), https://doi.org/10.16995/ntn.791.

126. Of course, Turner's *Helvoetsluys* (1832), which was hung right next to *Waterloo Bridge* at that year's exhibition, more directly (and notoriously) impacted the reception of Constable's painting; on this episode, see Rosenthal, "Turner Fires a Gun." On a longer tradition of intrapictorial comparison and the production of "visual environments" in the space of the Royal Academy exhibitions, see Mark Hallett, "Reading the Walls: Pictorial Dialogue at the British Royal Academy," *Eighteenth-Century Studies* 37, no. 4 (Summer 2004): 581–604.

127. *The Literary Gazette*, May 19, 1832, 314, quoted in Ivy, *Constable and the Critics,* 160.

128. Raymond Williams, *The Country and the City* (New York: Oxford University Press, 1973), 154.

129. Howard would have been familiar with Somerset House as a site of bureaucracy and registration, having, for example, visited in July 1818 to settle and pay the legacy duty on his father's estate; see "A Luke Howard Miscellany," 159.

130. On the General Register Office and its meteorological data gathering, see Anderson, *Predicting the Weather*, 8–9, 97.

131. "Verteilung der normalen Wärme" and "thermische Anomalie": H. W. Dove, *Die Verbreitung der Wärme auf der Oberfläche der Erde* [. . .] (Berlin: Dietrich Reimer, 1852), 13–23; and H. W. Dove, *The Distribution of Heat Over the Surface of the Globe* [. . .], trans. Elizabeth J. L. Sabine (London: Taylor and Francis, 1853), 13–24. According to Nathaniel B. Guttman, Dove's *Über die nicht periodischen Änderungen der Temperaturverteilung auf der Oberfläche der Erde* (Berlin, 1840) was the first to employ the term "normal" in meteorology; see Guttman, "Statistical Descriptors of Climate," *Bulletin of the American Meteorological Society* 70, no. 6 (June 1989): 602.

132. See Guttman, "Statistical Descriptors of Climate," 602–7; *The Role of Climatological Normals in a Changing Climate, WCDMP-No. 61* (Geneva, Switzerland: World Meteorological Organization, 2007), 6–7; and Anthony Arguez and Russell S. Vose, "The Definition of the Standard WMO Climate Normal: The Key to Deriving Alternate Climate Normals," *Bulletin of the American Meteorological Society* 92, no. 6 (June 2011): 699–704.

133. Georges Canguilhem, "Normality and Normativity," in *A Vital Rationalist: Selected Writings from Georges Canguilhem*, ed. François Delaporte, trans. Arthur Goldhammer (Brooklyn: Zone Books, 2000), esp. 351–52.

134. Georges Canguilhem, "The Living and Its Milieu," trans. John Savage, *Grey Room* 3 (Spring 2001): 21.

135. The exception, of course, is found in the incisive analysis of Constable's depiction (and occlusion) of laboring bodies; see Barrell, *Dark Side of the Landscape*, 131–64; and Bermingham, *Landscape and Ideology*, 138–45.

136. On this problem of estrangement and objectification in scientific discourse, versus the relationship to air as a "medium" of life and sociality, see Horn, "Air as Medium," 6–25; see also Schneider, "Seeing, Measuring, Perceiving."

137. Constable to Fisher, October 23, 1821, in Beckett, *John Constable's Correspondence*, 6:78.

138. See Bermingham, *Landscape and Ideology*, 147–55.

139. Luke Howard, *Barometrographia: Twenty Years' Variation of the Barometer in the Climate of Britain, Exhibited in Autographic Curves* [. . .] (London: Richard and John E. Taylor, 1847).

140. I am grateful to Jennifer Tucker for helping me to understand the centrality of electricity to Howard's theories of cloud "modifications."

141. Howard, *Seven Lectures on Meteorology*, 2–3.