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Climate Control, Modernism, and Mass Production

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Air-conditioning (AC) made images modern. It enabled two of modernity's paradigmatic and seemingly opposite visual forms: abstract painting and the mass-produced image. AC transformed art conservation, securing the field's scientific authority and adapting it to the demands of modernist painting. AC also played a crucial role in the development of industrial mass production, including the production of "mass images" in newspapers and magazines and on film. In both cases, AC transformed the labor of image maintenance and production by de-emphasizing the roles of gesture and manual inscription in favor of environmental management. Rather than touch up a damaged canvas, the twentieth-century conservator preferred to prevent visible changes from happening in the first place; rather than manually align color impressions, the twentieth-century printer sought to control flows and atmospheres in the pressroom. Of course, printing and preservation alike continued to require manual touch-ups and corrections long after AC transformed these practices. But expectations changed with the new technology: manual intervention on the image surface became more the exception than the rule, conceived as an act of repair or quality control, rather than regular maintenance. Climate control thus helped secure romantic and modernist ideals of the image's autonomy—the artist's control over and ultimate responsibility for

the image—by restricting the hand of the craftsperson whose work it was to preserve and transmit that image to others.

Every image has two realities: every image exists as both object and appearance. W. J. T. Mitchell has proposed that we call "pictures" those local manifestations of more fluid and intangible "images."[1] While the image-as-appearance appeals to the eye, the picture-as-object reacts to and interacts with its environment. Wood and fabric swell and contract, wet ink seizes up or runs faster and thinner, and pigments fade in sunlight or darken with oxidation. In Nicole Starosielski's recent work on the role of temperature in media, she argues that all varieties of matter "have their own thermosensitivities."[2] We can say the same for materials' sensitivity to light, humidity, and the surrounding air. Everything tangible will react to the matter and conditions that surround it; every picture will inevitably change over time. The "image," in Mitchell's terms, transcends the specifics of the more tangible, contextually rooted "picture." An image can survive the destruction of the individual pictures that host it; it can live on in reproductions or reinterpretations or even in verbal descriptions and memories.[3]

What counts as the "original" or "true" image—indeed, whether and how we separate appearance and object at all—is historically and culturally contingent. Consider, as do Alexander Nagel and Christopher S. Wood in *Anachronic Renaissance*, the shock of a Western visitor upon realizing that many ancient Chinese monuments receive a fresh coat of paint once a year and have for centuries.[4] This visitor has encountered a radically different paradigm of historicity, one in which the artifact does not stand as the unaltered trace of a moment past but instead obtains its historical authenticity from the continuity of care it receives. Conservation practices change over time and vary across space. So too do the conventions for representing and reproducing artworks: the forms of remediation (a handmade copy, an engraving, a photograph, a photomechanical reproduction) that allow us to feel we have truly seen a work of art.

The paradigms of conservation and reproduction I describe in this essay are specific to the twentieth-century West and particularly the United States. They constitute an "ideology of the image," a phrase I use to describe how individuals and institutions understand the relationship between an image's appearance and its materiality. (It is worth noting that Louis Althusser's classic definition of ideology—"the imaginary relationship of individuals to the real conditions of their existence"—puts the imaginary, the image, at its center.)[5] Image ideologies determine a picture's "truth," that is, what counts as a "good" copy in the production of multiples

or as an "authentic" artwork in the practice of restoration. These ideologies determine and are determined by technologies and practices of image making, reproduction, and conservation. The ideology I describe in this essay seeks to preserve the autonomy of the image by carving out a second autonomous space around it, one of environmental protection and control.

This essay proceeds in two parts. In the first, I argue that AC strengthened the material conditions in which artwork could appear as a bounded field of aesthetic experience and a singular expression of painterly intent. I do this primarily by examining the field of museum conservation, in which AC gave material support to the notion that viewers ought to appreciate paintings apart from their varied physical entanglements with their surrounding environments. As minimalist and postminimalist artworks confronted ideas about artwork's physical autonomy, the modernist conservation paradigm encountered new challenges. The second part of this essay examines the field of mass media. AC, as we will see, originated not as a technology of human comfort but instead as a tool of mass production, one that proved useful to broader historical processes of industrial deskilling and work discipline. Just as industrial work discipline treated time as empty and homogenous, AC emerged as the product of and support for a capitalist ideology of homogenous, empty air. This was also the case in pressrooms and film laboratories, where AC bolstered the view that photomechanical technologies reproduce images transparently and "automatically," thus preserving the "true" image by limiting the role of human hands and intentionality in its reproduction.

The unique art object and the mass-produced image are typically imagined as being at odds with one another. Yet, modern conservation science and image reproduction both defined the authentic image as that which is not just self-similar but also self-identical, an identity that persists over time or across multiple iterations. Maintaining such self-identity to fine degrees of precision required eliminating atmospheric interference. In recent years Eva Horn, John Durham Peters, Nicole Starosielski, Yuriko Furuhata, and other media scholars have argued that we ought to approach weather and air as media themselves, capable of communicating information and meaning.[6] In these accounts, the atmosphere comes to mean through its sensible fluctuations and variations. The movement of a cloud signals rain, and the humid intake of breath lets us know we have arrived in the tropics. These are, as information theory would put it, the atmospheric differences that make a difference. In what follows, AC functions as a tool that flattens out atmospheric variation so as to drive all meaning from the

air. As Starosielski has argued, "the manipulation of heat is critical to the transformation of the earth's raw materials into media."[7] Put another way, climate control's role in media culture has been to erase the air's mediatic and informational properties so that the media within it can achieve more informational density. Preserved in a perfectly controlled atmosphere, the modernist painting was better able to capture and produce atmospheric effects through its subtleties of texture, pattern, and tone; printed in air-conditioned rooms, books and illustrated magazines could capture such nuances more accurately. That modernist painting's presence required erasure of the sensible world surrounding it perhaps explains how the form of experience that Walter Benjamin called "aura" could wane in modernity, even as art institutions embraced aura's supposed material bases (uniqueness, presence, endurance in time) all the more passionately.

In their shared material basis, the modernist painting and the mass image both provoked theorists to describe the effects of these images as punctual and immediate. AC also provided a model of the experience, theorized in some of the most passionate defenses of painterly modernism, wherein forms of enclosure enable the free action of modern subjects and the free play of perception. That some forms of freedom have cost our world dearly is now well known: "The mansion of modern freedom," Dipesh Chakrabarty aptly observed, "has been built on fossil fuels."[8] The belief that an image can or ought to remain stable, down to its smallest detail and over vast stretches of time and space, developed within that very enclosure.

Painting: From Restoration to Preservation

In February 1958, the Museum of Modern Art (MoMA) issued a press release announcing the four-day closure of its galleries to update its AC system. Though in 1939 MoMA had been among the first museums in the world to air-condition its galleries, it now needed a new and expanded HVAC system. The update would ensure the comfort of the museum's patrons and, more crucially, secure the museum's valuable collection. Paintings, the press release explains, are "less adaptable to changing conditions than people, and complicated in physical structure."[9] Artworks thus require "a constant temperature and relative humidity, as their various parts respond unevenly to moisture."[10] With a new climate control system, MoMA would be able to maintain "24-hour ideal temperature" and an unvarying relative humidity in all parts of

the building, including "the carpenters' shops where pictures are often framed, the receiving space where they are unpacked, the storage tills where they are kept when not on view, and the restoration laboratory."[11] Two ideas in this press release remain at odds with one another: first, MoMA's insistence that paintings, by their very nature, require stable temperature and humidity, and second, MoMA's proud claim to being one of the earliest institutions to adopt AC a mere nineteen years prior. Painting, the press release implies, had waited centuries before it found itself in an environment that would properly meet its needs.

The installation of the massive Carrier Steam Absorption Machine took four days. Construction of the system's air ducts was to continue over months so as "to interfere as little as possible with the Museum's normal schedule."[12] One month after this optimistic prediction, a member of the team installing the ducts dropped a lit cigarette on a paint-splattered drop cloth, igniting a fire that killed one person and injured twenty-five. Museum employees, AC contractors, and firefighters worked together to remove as many artworks as possible from the danger. Several paintings were badly damaged by smoke, including a panel of Claude Monet's *Water Lilies* and Jackson Pollock's massive 1948 mural, *Number 1*. The incident precipitated the founding of MoMA's conservation department; previously, the museum had only contracted art restorers on a case-by-case basis.[13] The museum's first full-time conservator, Jean Volkmer, had trained with Sheldon and Caroline Keck, a married couple who sought to define a modern, scientific practice of art conservation for the postwar United States.[14]

The Kecks made it their mission to train future conservators and to educate the general public about the care of artworks. Together, they curated public exhibitions on conservation at the Brooklyn Museum, produced short films on the care of aging paintings, and published several instructional books aimed at private collectors and small-museum curators.[15] Through these public-facing acts of transparency, the Kecks sought to distinguish their work—and the science of twentieth-century conservation generally—from the more secretive arts it succeeded. "A few years ago," Sheldon Keck wrote in 1948, "a conservator was called a restorer. . . . Magic formulas, magic hands, and magic eyes were among the nostrums of his secret craft."[16] As late as 1967, Caroline Keck (the more prolific author of the pair, whom I will refer to in what follows by her last name only) complained that "less than a decade ago, one New York museum employed a gentleman who insisted on treating its paintings in a locked room, forbidden to any member of the staff."[17] For centuries, she continued, restoration had entailed "elaborate

repainting," changes to the "character and form of the original" that served to subtly—or not so subtly—update aspects of the painting's style or increase its resale value.[18] By Keck's account, restoration had long operated under a kind of substitutional logic by which a painting could maintain its identity even if every individual inch of its surface had been replaced. "The restorer was the person who improved appearance, made the object complete, and brought it in tune with the taste of his public, without regard to original style and occasionally not even original form," she explained. "Only recently has this become a crime."[19]

The "modern" approach to art restoration, according to Alessandro Conti, treats the canvas as a historical record of an artist's gestural intent; according to Conti, this attitude emerged in the late eighteenth century, when Romantic beliefs about artistic expression formed modern notions of art's autonomy.[20] By some accounts, then, the Kecks' approach may not have been entirely new. But local practices and attitudes toward conservation varied widely across Europe and North America in the nineteenth and twentieth centuries. The Kecks witnessed numerous public conflicts surrounding art conservation, including the great "cleaning controversies" that emerged after the National Gallery in London's 1947 *Exhibition of Cleaned Pictures*, which spurred discussion and debate well into the 1960s.[21] The exhibition showcased a group of Old Masters paintings (including works by Peter Paul Reubens, Rembrandt, and Diego Velázquez) returned to their "original" states through new scientifically supported methods. Conservators removed layers of varnish—some applied as recently as the nineteenth century—that had darkened and yellowed with age. The cleaned paintings appeared to many viewers shockingly, even garishly, bright. Some London newspapers published letters complaining that by making the paintings look "new," conservators had somehow stripped the works of their historical aura.[22] Years of debate ensued, but by 1962 the *Burlington Magazine* could declare it "beyond dispute" that museums should present paintings "as nearly as possible in the state in which the artist intended them to be seen."[23] The image ideology, in short, was changing: to remove the interventions of nineteenth-century collectors was now an essential step toward revealing the truth of Rembrandt's art. The accumulated layers of care surrounding the artifact, to the extent that these modified the work's appearance, did not add to the work's significance but instead threatened it.

Keck described a similar shift in image ideology in her elevation of the term "conservation" over its purportedly old-fashioned predecessor, "restoration." The latter term "seems to connote only

improved appearance." Keck uses a somewhat cruel analogy of a woman with cancer going to the beauty parlor and expecting it to save her life. "If you can save a picture before it goes to pieces," she continues, "it won't need to be 'restored,' you can 'preserve' it."[24] As opposed to restoration, conservation aims to ensure that structural threats to a painting's integrity are not merely painted over and thus ignored. The dangers latent in a picture's material base are addressed from the inside out as soon as they become apparent, or even sooner.

Environmental conditions in the museum or gallery, the Kecks repeatedly emphasized, are crucial determinants of a work's structure and appearance. Consistent temperature and humidity could prevent much visible wear from marring the surface of paintings, and such preventative measures may even put the traditional "restorer" out of a job, as in one vivid example:

> During the 1930s in London at the National Gallery, a technician was employed whose sole task, during the eight months of the year when artificial heat was used, was to correct defects on the paintings as they occurred. For the duration of World War II, the collection of the National Gallery was removed for safekeeping to a specially prepared repository. It had a temperature constant of 63F and a relative humidity of 58 per cent. . . . The longer the pictures remained in their secure environment, the less he had to repair, and after five years his visits became a mere formality.[25]

When the paintings returned to the National Gallery, the technician returned to his job in every part of the museum except "in the newly installed air-conditioned rooms." The lesson Keck drew from the incident was this: "We can repair damage, but without a controlled atmosphere we must realize that time works against us in more ways than one."[26] Mere stability was not enough; even an unchanging environment might offer its object the wrong climactic conditions for long-term survival. In another anecdote, Keck bemoans the fate of a Raphael painting that spent the war in a severely dry bank vault and, upon emerging, turned to dust right in front of its astonished owners.[27] Both examples suggest that World War II—a period in which many European museums and collectors removed artworks to protected spaces—occasioned a reexamination of academic and popular thinking surrounding the care of artworks.[28] In Keck's account, preservation work is the work of protection, not the work of making physical marks on the canvas surface. Doing this work entails finding and maintaining a painting's optimal storage environment.

Recall the distinction, made at the start of this essay, between the picture as an object and the image as an appearance. An older model of art restoration sought to preserve the image by physically replicating missing or damaged parts of the picture surface with as much manual skill as possible. In the extreme examples Keck describes, the restorer traces a new picture, wholesale, on top of its model, effectively creating a mental image of the ideal artwork and casting a new picture in its mold. The artwork in these cases maintained its identity through a good-enough resemblance, physical continuity, and the restorer's authority. (Conservation practices in which restorers subtly—or not so subtly—update an object's appearance aspire to alternative models of authenticity than the modern imperative to preserve the artist's original intent or the object's historical integrity.) In Keck's model of care, there is still room for a judicious hand to inscribe the picture surface, but the conservator's ethics dictate that she does this as little as possible. Moreover, any manual intervention into the picture surface must be thoroughly reversible, and the conservator must keep a clear and thorough record for her successors, who may choose to maintain or eliminate any of her small alterations.[29] The conservator's authority still matters, but she is now less an artist in her own right than she is the artwork's historian. She is responsible for documenting the specifics of every treatment or cleaning, thus drawing a firm line between the artist's work and her own.

The conservator also becomes the caretaker of a space. She manages the rooms in which paintings are exhibited and stored, participating in the delicate work of maintaining that environment. In *Still Life*, a study of the museum as a social institution, Fernando Domínguez Rubio attributes to the modern museum and its artworks an "aesthetics of containment," one that combines modern ideas of aesthetic autonomy with practices of environmental enclosure.[30] The modern museum's aim, according to Rubio, is to keep "unruly objects" within their socially assigned boundaries, boundaries that include visual self-similarity over time.[31] In the contemporary museum, AC is essential to this project. But containment aesthetics long predate the advent of mechanical climate control: in earlier centuries, Rubio writes, the application of varnishes and frames sealed and enclosed paintings, offering them some limited protection against dust and humidity.[32]

Modernist paintings—the kind championed by postwar critics such as Clement Greenberg and preserved by powerful institutions such as MoMA—necessitated a new aesthetic of containment and larger spaces of enclosure. This is partly because they rejected earlier containment strategies. Consider some of the formal novelties

of Pollock's large abstract paintings. Bits of bare canvas, without even the protection of a painted ground, peek out from the gaps between his splatters. No varnish mediates the visceral presence of paint. The finished paintings often hang unframed, revealing that Pollock painted them before stretching; his densely patterned splatter fields continue off the painting's surface and wrap around its scant depth. (Many other notable postwar abstract painters used similar strategies.) Without naming particular artists, Keck commented despairingly on just these trends.[33] In her telling, she was often at pains to convince contemporary artists to embrace the protections of frames and varnish. She describes the small triumph of convincing an abstract painter to let her use a thin, removable varnish on "an almost all-white mat-surfaced painting that hung in a New York office," its monochromatic form offering a kind of extreme case study in its capacity to show every speck of dust, every accidental touch, every place where the pigment had yellowed or faded unevenly.[34]

The monochrome is uniquely vulnerable to wear, according to conservator Carol Mancusi-Ungaro, because its aesthetic effects rely on subtleties of texture, such as the varied reflectance when different paints of the same hue are mixed and juxtaposed.[35] One of the most famous botchings of modern art restoration was the 1991 revision of Barnett Newman's *Who's Afraid of Red, Yellow, and Blue III* (1966–1967), which required repair after a museum patron slashed the canvas with a knife. Critics complained that the restoration must have required nothing more than a single hue of house paint and a roller.[36] The conservator, it would seem, misunderstood the painting's surface as a simple assertion of subject matter—its red as merely red—and not as a play of subtle tonal effects. When, eleven years later, the same vandal returned to attack Newman's blue monochrome *Cathedra* (1951), the Stedelijk Museum took the opportunity to try a different restoration approach. Experts "painstakingly filled and expertly inpainted each intrusion locally."[37] But restoring a monochrome by hand is risky. In Mancusi-Ungaro's words, "the touch of a watercolor brush can irreparably interrupt the serene matteness of a surface," and "compensations" that might remain invisible in figurative painting reveal themselves on a subtly patterned canvas.[38]

The challenges of preserving abstract paintings figure quite literally in Keck's manuals: the first two images in *How to Take Care of Your Pictures* illustrate, in nearly caricatured form, an abstract versus a figurative painting (figure 1). One painting (figure 1b) depicts a portrait of a woman in a hat holding a flower; it could represent any number of portraits from several art historical periods. The
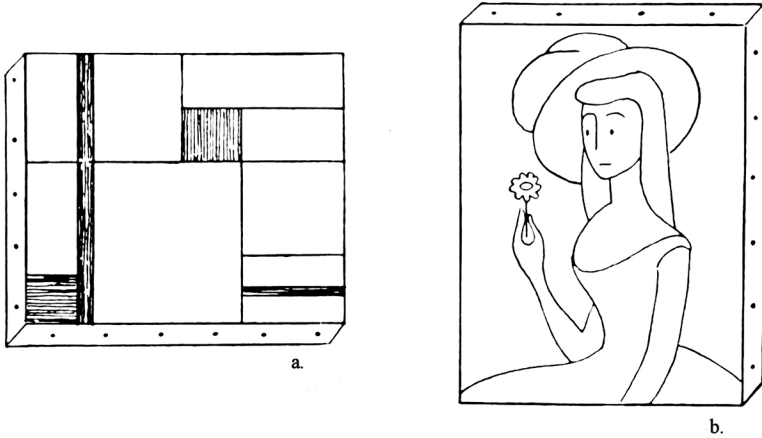
Figure 1. From Caroline Keck, *How to Take Care of Your Paintings*, 2nd ed. (New York: Scribner, 1978), 12. Illustrations by Ruth Sheetz Eisendrath.

other painting (figure 1a), however, appears to explicitly reference Piet Mondriaan's colored grids. Curiously, these two paintings illustrate the exact same sentence: "Compared to most things around us, a painting has almost no thickness at all."[39] The text never mentions differences between these paintings; the point, perhaps, is that paintings are and remain relatively flat, whatever they depict. (As Leo Steinberg once cleverly put it, "a cat walking over pictures by Tiepolo and Barnett Newman gets the same support from each one.")[40] But in Keck's book, the formal flatness of the modernist grid is far from immaterial when it comes to the painting's physical integrity. Throughout the text, it's the faux Mondrian—and not the portrait—that appears again and again to illustrate the varied fates that paintings suffer. Over the course of Keck's book, we see the modernist grid touched with bare hands, leaned against walls, and hung directly from its stretcher. Its canvas ripples and buckles, and these distortions appear more starkly against the imaginary painting's geometric, abstract forms, than they would if they warped a figurative scene (figure 2).

Put another way, illusionism in painting accustoms viewers to the task of looking through the canvas to an imagined three-dimensional space behind it. This habit allows us to peer though the patina of age—a yellowing varnish, a fine mesh of craquelure—as we might a dusty or gridded windowpane. The viewer of an Old Masters painting, Clement Greenberg wrote, could "peer through the object-surface into what it is not."[41] Greenberg famously and irascibly defined modernism as Western easel painting's slow prog-

ress toward acknowledging its flat, bounded nature.[42] For Greenberg's follower Michael Fried, this progression—toward paintings more and more inclined to make plain the fact that they comprise nothing more or less than paint on canvas—introduced the risk or possibility that viewers might see paintings as mere objects. "The fundamental difference between paintings and objects," he wrote in "Art and Objecthood," "is that a painting is so to speak all surface, nothing but surface, whereas no ordinary object, however thin or flat, can be described in those terms."[43] In his notorious polemic, Fried defended Greenbergian ideals of aesthetic autonomy and medium specificity against direct challenges from new movements such as Minimalism. For Fried, painting's true task was to acknowledge its materiality but also allow the pictorial to triumph, in every instance, over the literal.

What interests me here is not whether this ultimate judgment of 1960s art is correct. (For the record, I believe that Fried offers an elegant summation of modernist painting's achievements while failing to remain open to the beauty and interest of minimal and post-miminal approaches to art.) Rather, Fried's theorization articulates many of the deep assumptions behind modern conservation practices as well as the challenges that modernist painting presented to conservation. The midcentury theories of conservation I have described regard the painting's surface as a record of the artist's
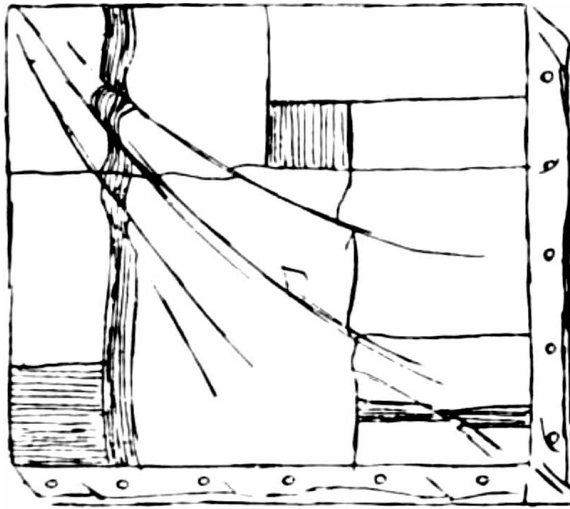

Figure 2. From Caroline Keck, *How to Take Care of Your Paintings*, 2nd ed. (New York: Scribner, 1978), 27. Illustrations by Ruth Sheetz Eisendrath.

expression and aim above all else to maintain the stable integrity of that surface. Other historical interventions onto the work's surface—say, a previous conservator's additions or a particular pattern of fading derived from its specific placement in a gallery—are not, strictly speaking, part of the painting itself. Put another way, the painting may be an object in the literal sense of the word, but the real art in it consists in whatever aspects of the painting are the object of our aesthetic interest.[44] The painting's verso is not the artwork, nor is a shadow that happens to fall across its surface. When a vandal slashed Newman's *Cathedra* with a knife, its sudden change in appearance did not make it a bad painting or even a changed painting. Instead, the damage opened a fissure between image and object that the conservator set out to repair. The challenge that *Cathedra* presented was that, in a work that thoroughly embraced its flatness, "every grain or particle or atom of surface competes for presentness with every other," so even the smallest change to the painting's surface might fundamentally alter its meaning.[45] If, according to high modernist dicta, art survives as art insofar as it presents an autonomous visual world, one that is enclosed and separate from the "real world," how, then, was the viewer to react when the real world impinged upon the canvas? The conservator's response was to prevent the real world from entering the museum in the first place: to strengthen the spaces of environmental enclosure surrounding the modernist artwork.

Artists themselves answered these questions differently. Take another series of monochromes: Robert Rauschenberg's 1951 series of *White Paintings*. Meant to refuse even a hint of painterly gesture, these pure white monochromes had none of the subtle tonal effects that appear in works such as Newman's. They were created using plain white latex house paint, sometimes applied with rollers, and other times with a brushwork so fine as to be barely visible.[46] Rather than invite the viewer to become absorbed in a bounded pictorial space, one that exists independently of its surrounding environment, the *White Paintings* instead took their surrounding environment as their subject matter.[47] John Cage famously called them "airports for the lights, shadows and particles" that surrounded them; Rosalind Krauss imagined them as "screens on which to 'trap' (no matter how ephemerally) the shadows of passerby."[48] The *White Paintings* heralded the arrival of works in three dimensions that similarly challenged the enclosed, frontal framing of modernist art: the human-scaled boxes of Robert Morris and Donald Judd, Yvonne Rainer's antispectacular form of dance, and Eva Hesse's delicately spun plastic nets. The irony, of course, is that this aesthetic turn toward atmosphere occurred just as the

spaces of art exhibition became more enclosed and controlled. Anthony McCall once recalled the first time he showed his film *Line Describing a Cone* in an art gallery; without the ambient dust and cigarette smoke of the downtown lofts that usually screened the film, its titular "cone" was invisible. The museum's air was too clean, too controlled. Today, McCall fits the galleries that screen his films with artificial smoke machines.[49]

The *White Paintings* introduced yet another paradigm of conservation. What was important to preserve was not so much picture or object but, rather, concept. The content was their effect, and their effect was to force the viewer to recognize the paintings' objecthood and thus the contingent environment structuring the encounter between viewer and viewed. In this context, a thin layer of dust could only enhance the paintings' meaning. But if the canvas became so scuffed or damaged as to threaten its obdurate and insistent blankness, the entire effect suffered. In these cases, Rauschenberg or one of his studio assistants simply repainted the entire surface or even fabricated entirely new paintings in the same dimensions.[50] The embrace of painting's "objecthood," then, required a new conservation practice, one in which, as Martha Buskirk has argued, the artist or the artist's estate becomes the administrative force issuing the terms and conditions of reproduction. While "the artist's touch may be less evident in the physical process of making," Buskirk writes, "the artist's ongoing presence and decision-making have become more important."[51] The artist became less the artisan and more the factory foreman; he harnessed a range of productive forces, from industrial fabrication to the work of assistants to the apparatus of publicity.[52] These forces now explicitly included the enclosed spaces of exhibition and conservation.

The Mass Image: Standardizing the Routine

Le Corbusier once proclaimed that his design methods would impose a "regime of 18 Celsius" upon all the buildings of the world. "Every nation," he wrote, "builds houses for its own climate. At this time of international interpenetration of scientific techniques, I propose: one single building for all nations and climates, the house with exact respiration."[53] Le Corbusier numbered among the many twentieth-century architects who attempted to regulate interior climate through structural (rather than mechanical) means: shading, louvers, and awnings. Daniel Barber has argued that such modernist projects introduced the idea that "the designed interior" can

and should be "a space of thermal optimization," even as other aspects of International Style architecture presented thermal disasters.[54] The window walls and open floor plans of Philip Johnson's and Mies van der Rohe's Seagram Building—completed in 1958 a few years after Johnson's modernist additions to MoMA—have made it one of the most energy-inefficient buildings in Manhattan. Modernist architecture's contradictions, Barber argues, thus paved the way for widespread acceptance of AC. By 1969, Reyner Banham was able to argue that energy-intensive AC had "demolished almost all the environmental constraints on design. . . . For anyone who is prepared to foot the consequent bill for power consumed, it is now possible to live in almost any type or form of house one likes to name in any region of the world that takes the fancy."[55]

Put another way, AC allowed the building as an aesthetic object to transcend the restraints of its environment: architecture could achieve the sort of bounded, enclosed aesthetic autonomy that had long characterized the modern easel painting. For Barber, the effects of mechanical climate control range even wider. AC, he writes, is a kind of "people conditioning," a profound restructuring of the human sensorium through which "a specific kind of human was imagined to occupy interior space in new ways."[56] Historians of art, architecture, and media typically take this to mean that AC transformed the way people live. But it also restructured the way they work.

AC was born in the factory. It emerged not as a technology of human comfort but instead as a manufacturing tool, one that for the majority of the twentieth century had a constitutive role in the creation of mass-produced artifacts. Most of the early innovations in climate control technology did not belong to the field of "comfort air conditioning," as engineers called it; they developed within the more dynamic and lucrative field of "process air conditioning." Process AC was temperature and humidity control for manufacturing facilities, an innovation designed not for worker comfort but instead to ensure a consistency of materials that would allow for increased mechanization and production speed.[57] It was only in the factory environment, according to Banham, that there were "problems big enough, and profitable enough," that AC became cost-efficient, a way of "losing less, and making more, money."[58]

The idea of humidity control initially came from a textile industry practice called "yarn conditioning," a technique as simple as keeping cotton and wool fiber wet as it was woven into fabric.[59] Wet fiber, being already saturated, absorbed less moisture from the air and so was slower to change its shape, feel, and working properties when environmental conditions shifted during the weaving

process. In turn, dry air sometimes stole moisture back from dampened fabric, so the textile industry preferred a humid factory environment: British industrialists claimed that Lancashire's natural dampness accounted for the wild success of its cotton weaving industry.[60] But soon natural humidity, even in Lancashire, was not enough to keep pace with desired production. Mills in England and the United States started to pump the air full of hot steam, in many cases making already hazardous working conditions scarcely bearable.[61] Although modern AC would eventually improve conditions for some workers, employee comfort and happiness figured little in early corporate enthusiasm for the new technology. "No, our ultimate goal is not comfort," asserted L. L. Lewis, one of the cofounders of Carrier Air Corporation. "It is to give man or woman a fair chance to apply the fundamental of creating wealth by producing up to the limit of his latent capacity."[62] Whose limits would be tested and who would enjoy the resulting wealth Lewis did not specify; he did not need to. He and other advocates for the technology made it clear to potential clients that AC was not beneficence toward workers. It was a tool for increasing profit by rationalizing the working process.

Like most technologies, AC has its origin myth. While development of modern AC systems was gradual—full of stops and starts—one moment is repeatedly singled out as a first. In 1902, the Sackett-Wilhelms Lithographic and Printing Company of Brooklyn, New York, asked Buffalo Forge engineer Willis Carrier to develop a process of humidity control for its pressroom.[63] Sackett-Wilhelms produced educational lithographic prints for classrooms as well as the satirical color magazine *Judge*.[64] Since the nineteenth century, color printing processes have mostly shared the same basic principles. A source image is divided into a finite number of predetermined hues of translucent ink; these layers are then superimposed in precise alignment in order to give the impression of a single and seamless multicolored image.[65] Printers use the term color registration to refer to the proper alignment of these color impressions on a single piece of printing stock.[66] In her genealogy of "thermal media," Nicole Starosielski describes how a fluctuating climate might vex this process. "As individual sheets were passed multiple times through a printer, if temperature and humidity changed, the inks would be overlaid imperfectly. The image would vary from the intended production, and each image might be slightly different from the others."[67] Paper is inherently hygroscopic: it absorbs water from the air and thus swells and contracts with fluctuating humidity. In the late nineteenth and early twentieth centuries, many small-job printers distributed color impressions over several days,

giving ink time to dry. According to one 1921 trade journal, a color job "may go through the press today and be printed in yellow, then run through tomorrow for red and a day or two later for blue," but because humidity might vary significantly during this process, paper dimensions could vary up to an eighth of an inch from one day to another.[68] In the 1880s, the Boston lithographer Louis Prang described paper sheets as "so lively during the process of printing" due to fluctuating weather that sometimes "a whole edition may have to be given up as a sacrifice to the elements."[69]

Carrier aimed to solve this problem by controlling pressroom humidity. The device he created for Sackett-Wilhelms pulled room air into a duct filled with small pipes running with cool water. These cold surfaces attracted condensation, thus drawing moisture from the air. An exhaust fan at the end of the duct then pushed the dehumidified air back out into the pressroom. Later designs for an "air washer" sprayed water over baffles, but the basic concept remained the same: condensing water from the air to sap its humidity.[70] A salutary effect on the room's temperature was a pleasant side effect. Carrier called his product "Manufactured Weather" and eventually developed a range of temperature and humidity control devices for his Carrier Engineering Corporation, which is still a leading manufacturer of HVAC systems in the United States. Carrier's corporate mascot was the "Mechanical Weatherman," a cartoon character who appeared in newsletters and instructional manuals touting his slogan: "Every Day a Good Day" (figure 3). The 1919 promotional book *Manufactured Weather* used an image of the Mechanical Weatherman to illustrate the principles of color registration. "For instance, take the cut which appears on the title page of this bulletin. . . . If the paper had swelled or shrunk while the red ink was drying, . . . the black portions of the cut would not have fitted the red portions. . . . But if the plant has equipment for manufacturing its own weather, all of these difficulties are obviated because . . . the controlled atmosphere *standardizes* the routine of the shop."[71] The same 1919 booklet explains the influence of AC in not only high-speed color printing but also numerous other industries including motion pictures, where stable atmospheric conditions prevented the fogging or curling of individual film prints. "Every time you see a movie," Carrier reminds its readers, "think of manufactured weather."[72]

Indeed, Carrier's own engineers published articles aimed at the film industry: a 1931 article in the *Journal of the Society of Motion Picture Engineers* compared the modern air-conditioned film processing laboratory with a colorful description of its predecessors. In a Bayonne, New Jersey, lab in 1909, the authors claim, "the

Figure 3. Interior title page from *The Story of Manufactured Weather* (New York: Carrier Air Corporation, 1919), 7. Accessed at the Hathi Trust Digital Library (hathitrust.org).

entire equipment for the regulation of atmospheric conditions consisted of two coal stoves" and a structure permeable enough "to permit ice to form upon the floor. . . . The time of drying was very indefinite, . . . varying from one-half to twenty-four hours."[73] As the authors concluded, "One can well imagine the regulation obtainable with such equipment."[74] We cannot know how exaggerated this account is; certainly its authors had every reason to cast the uncontrolled laboratory environment as the chaotic source of inconsistent results. But the literature on film laboratories repeatedly describes atmospheric fluctuation as an enemy of print quality, standardization, and uniformity.[75] When, for instance, wartime shortages limited film laboratories' access to the refrigerant Freon, laboratory engineers declared it an emergency confronting the whole industry.[76] Projectionists also cited humidity fluctuation as a source of potential vexation, as changes in print dimensions could cause frame registration errors, or "overshooting," at "the slightest

variation to the thickness of the film, or the condition of its dryness."[77] In both production and exhibition, the standardization of the film image—its capacity to offer different viewers of a film the same visual experience across time and space—depended on the maintenance of a stable atmosphere.[78]

This specific origin story, this entwinement of AC and image standardization, is repeated again and again in histories of AC—from workaday AC manufacturer websites to the US Department of Energy website to the institutional history of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers.[79] For the AC industry, this narrative speaks to the scale of its ambitions. Even as "comfort AC" began to match "process AC" in its cultural and economic importance, industry publications stressed the fact that the technology could achieve a mastery and control of the environment that surpassed even conscious human perception. This correlation of climate control and precision continues today: Starosielski situates printing within a variety of industries, such as data centers and semiconductor manufacture, that use thermal control "to reduce the amount of error and noise in media representations." The energy burn fueling media industries, she argues, continues to secure broader cultural values of purity, uniformity, and standardization.[80]

But standardization of output is only one part of AC's meaning when it comes to mass production. There was also the standardization of what Carrier called "the *routine* of the shop": the habits and techniques of workers. In *Air-Conditioning America*, Gail Cooper argues that process AC standards "did not represent any greater insight into the response of natural materials to weather fluctuations than that supplied by experienced spinners, weavers, or overseers."[81] What AC did, rather, was provide management with an alternative to its previous reliance on workers' embodied knowledge of the atmosphere. Prior to the rise of AC, hygroscopic materials such as paper and pasta had required intermittent production schedules. Macaroni, for example, "cannot be made every day in the year or month or week," a 1904 source explained; with too much humidity, the dough could not hold its shape until dry. Pasta factories thus relied on workers' skilled judgment: it was the workers, not the company owners, who had the experience and insight to determine which days were suitable for drying pasta and which days were not.[82]

Carrier even framed its innovations specifically in terms of de-skilling labor and transferring control of production from workers to management. As Cooper writes, the company had its own field specialists devoted to adapting AC to the demands of specific man-

ufacturing processes. Carrier's macaroni specialist, for instance, explicitly conceived of the company's pasta-drying system as a means of breaking labor's control. Cooper quotes him at length:

> When I say it does not require macaroni skill, I mean that it does not require a man familiar with macaroni to dry it with our dryer. . . . You may wonder what that may mean to the manufacturer. It means that instead of a small field of men to hire from, he can chose [*sic*] from a large field. Then too, if a man quits, there is no great loss, for a new one can be taught in less than a week to do with our dryer what in the past men have taken years to learn.[83]

By homogenizing the atmosphere of factories, pressrooms, and workshops, managers who adopted AC in factories were able to subject manufacturing processes to greater degrees of mechanization and automation, thereby circumventing the worker's control of production. "Artificial climate replaced natural climate," Cooper observes, "and the skills that went along with it."[84] Climate control therefore continued a process that, according to Manuel De Landa, started in the early nineteenth century when "the sensual relationship to matter, so integral a part of the artisan's craft, was gradually replaced by mechanized production."[85]

In his classic essay on the emergence of capitalist "time-discipline" in England, E. P. Thompson charts the changing meaning of such intermittent production patterns. Before the coming of large-scale mechanized industry, many work schedules followed a logic of need. "The working day might be lengthened or shortened," Thompson wrote, "within the general demands of the week's or fortnight's tasks."[86] But as industrialists became more accustomed to timing labor "by the clock," they saw irregular work patterns as "wasteful and lacking in urgency."[87] Time, Thompson famously argues, thus became a battleground, one on which workers and management struggled for control of production. Work slowdowns, often called "pacing" or "slacking," became a tool with which industrial workers resisted management either overtly or in subtler, less organized terms.[88] For many industries, particularly those with low levels of mechanization or high standards of craft, irregular production persisted into the twentieth century not as a form of grievance but instead as a norm. Examples Thompson cites include printing and pottery, both trades that, perhaps significantly, make use of materials that are especially sensitive to the weather.[89]

Precision printing in fact existed before the advent of AC. Chromolithography emerged in the 1830s, and immediately printers were able to create color prints to fine registrations.[90] It was

not until seventy years later that the printers at Sackett-Wilhelms apparently complained that atmospheric fluctuations made inter-color registration impossible. What changed? For one thing, the scale and speed of print production increased; so did its degree of mechanization. In the early twentieth century, wet-color sheet presses became faster and incorporated mechanized paper feeds.[91] Newspapers, meanwhile, adopted a continuous form of "web" printing, so named for the long paper spools, or "webs," fed continuously through a rotary press.[92] Color reproduction eventually spread beyond the confines of fine lithography and into news-papers and magazines, in which color adorned comics, fashion spreads, and the illustrated Sunday supplement. In web print-ing, proper color registration required not only the alignment of color layers in space but also the coordination of their imposition in time, as a single spool of paper traveled continuously through four different color cylinders. The comics pages integrated bold blocks of color through web printing in four-color relief; for finer and more detailed impressions, such as photo supplements, pub-lishers used a high-speed rotary method of intaglio printing called rotogravure.[93] On such high-speed presses, color printing was no longer a matter of aligning and timing individual impressions, one after and atop another, on a single piece of printing stock. Rather, four-color rotary printing was entrusted to the consistent operation of the mechanized press and the consistent working properties of paper stock and ink. Changes in the dimensions and flexibility of paper or in the viscosity of ink were liable to cause uneven web ten-sion. This, in turn, threatened not only color registration but also the evenness of impressions and their placements on the page.[94]

For centuries, printers had managed inconsistent materials through a combination of experience and instinct, knowing when and how to dampen paper stock, when to wait for better condi-tions, and when to permit a marginal difference in color registra-tion.[95] Printers' own sensitivities to the weather were undoubtedly crucial data incorporated, even subconsciously, back into working processes. The kinds of embodied techniques that allowed printers to respond to daily fluctuations in the weather were not easily ver-balized; what printers did to maintain image quality—to do their job well—may have looked to a publisher or a client like pacing or slacking. Strict control of the pressroom's climate made printers' embodied expertise in the interactions between air and paper use-less and unnecessary; indeed, climate control eliminated the very material basis for this expertise. In mass media as in conservation, AC transformed the work of image reproduction, in this case mak-ing that labor more standardized.

A standardized production process requires standardized materials. If it is difficult for us to grasp the constant changeability, the ungovernability of things so supposedly inert as paper and ink, it is because climate control imposed on mass production a certain presumption that remains with us to this day: that raw materials are passive, and human volition is the only agential force that molds them.[96] Jane Bennett notes that American materialism—that is, the culture of mass-produced commodities—is in fact a form of "antimateriality," a means of concealing "the vitality of matter." Less remarked upon is the fact that this commodity culture relies on a mode of production that, in its turn, seeks to tame matter's vibrancy and agential power. Once one can presume that ink and paper will hold their weight and dimensions to extremely fine degrees, other aspects of the printing process can be further standardized through mechanization and automation. In these cases, mass production does not require the guidance of human beings who are alive to the constant flux of their environment. It requires other skills instead. Pressman J. Russell Parrish characterized the traditional pressroom as a "World War I Jenny which the pilot had to fly 'by the seat of his pants,'" while the technique required to operate the massive pressrooms of the 1950s resembled those of flying "a jet fighter plane," with its "numerous controls and complicated instrument panel."[97] "More than a craftsman," Russell asserted, the new press operator needed "the ability to supervise others working on his 'team.'" Like the artist, the artisan too became a sort of manager.[98]

Was this change visible? Can we sense—in the look and feel of illustrated newspapers, magazines, film prints, and projections—the fact that AC froze the dimensions and working properties of materials? Can we see the ways AC, as handmaiden to other forms of mechanization and automation, drove human hands further from the web of paper or the ribbon of film, just as it drove the conservator's hand away from the canvas and toward the thermostat? These questions are difficult to answer empirically, as are questions regarding so many other sweeping changes that transformed mass media industries over the course of the twentieth century. What is clear is that higher degrees of mechanization and automation in printing and other media industries bolstered ideas of these media's precision and exactitude as well as ideas about mass media's potential for endless growth. The less human labor image reproduction seems to require, the easier it is to imagine that the mass image might enter a state of limitless, instantaneous multiplication and circulation.

Instantaneous Impressions

In *Imagined Communities*, Benedict Anderson traces how the newspaper created a national and global sense of "homogeneous, empty time."[99] The coincidence of disparate news items on a front page heightened the sense that events proceeded simultaneously even in radically different geographical and cultural contexts; moreover, the fact that the reader sees "exact replicas of his own paper being consumed by his subway, barbershop, or residential neighbors" helped him imaginarily link his individual being to a broader sense of simultaneous time.[100] Print capitalism's visual production of simultaneous, homogeneous time thus relied on the visual production of a mass image.

This production drew on a similar homogenization of the pressroom. Just as corporate time-motion studies had treated time as empty and homogeneous, so too did the increasing mechanization of image reproduction require the homogenization of the air, a smoothing out of atmospheric fluctuation. Variations in the alignment or quality of printed images indexed fluctuations over time in the environment of production. By erasing those fluctuations, AC produced the illusion that each copy of a given newspaper edition was produced as though simultaneously. A base level of actual uniformity allows two readers hundreds of miles apart to pick up different copies of a newspaper—printed in different facilities, with different paper stocks and different raw materials—and confidently say they are viewing the "same" front-page image. In the mid-twentieth century, when cheaply available, highly detailed colored images became a requisite part of the visual and print culture of the United States, AC allowed audiences to view these mass images as punctual, even instantaneous visual impressions, as documenting the world while issuing from some nonplace outside of it.

Thus transformed, print media became suitable for depicting the very sorts of abstract art described in the first section of this essay. As finely detailed colored images in near-perfect alignment became cheaply available on a mass scale, mass production was suddenly suitable for reproducing tonally nuanced or dense irregularly patterned fields of abstract color. In 1953, William Ivins argued that it had been the late nineteenth-century emergence of the photomechanical halftone that had finally allowed the artwork to enter print without being translated into the manual "syntax" of handmade engraving, where "the only personal qualities visible" in the image "were those of the men who made the drawings that were reproduced."[101] Evoking the set of concepts that Lorraine Daston and Peter Galison would later call "mechanical objectiv-

ity," Ivins suggested that only impersonal, mechanical methods of transcription allowed for the authentic transmission of the artist's hand.[102] For such a mode of reproduction to progress from its late nineteenth-century form (black-and-white reproduction, by the tens of thousands) to the scale of the mid-twentieth century (full color reproduction, by the millions) required the fine degrees of control that AC provided. Reproducing Pollock's delicate all-over splatters for *Life* magazine, after all, required perfect color alignment. Reproducing Rauschenberg's *White Paintings*, on the other hand, was both simple and impossible, impossible because the work's meaning consists in something other than its sheer graphical impression.

This comparison suggests that the modernist aesthetic values of flatness, opticality, and immediacy—all qualities that Greenberg and Fried attributed to modernist painting—have an ironic resonance with the visual culture of mass media. Greenberg's theories, as Caroline Jones has argued, emerged alongside discourses and practices in commercial art that sought to "brand the retina" with advertisements and corporate logos, and alongside the billboards, magazine covers, and projected films that arguably achieve a truer flatness and a more punctual interruption of the visual field than their more rarified counterparts.[103] For Jonathan Crary, modernist aesthetics and mass-produced spectacle alike emerged from a modern regime of the optical, a "separation of the senses" that began when physiological vision became an object of scientific inquiry.[104] Similarly for Jones, the "highly reduced" and "intensified" visual stimuli of modernist painting reflected and conditioned urban Western modernity's "bureaucratization of the senses."[105] Both of these art historians suggest that opticality is an effect of scientific and aesthetic discourses on human vision and subjectivity, that the separation of the senses and the isolation of vision occurs within the human subject of capitalism and modern physiology. With this essay, I have added to these interventions an account of the picture as an object, a "materialist media theory," to use Grant Bollmer's term, that broadens existing genealogies of optical flatness.[106] Material practices and cultural techniques—embodied in both the workings of machines and in the cultures of craft and care that surround images—ground regimes of opticality.[107] And regimes of opticality have in turn transformed the spaces, technologies, and labor of image production.

Climate control thus supported a certain theory of an image's integral power. This theory can be expressed as a formula of sorts: the more hands and labor that visibly mark an image's surface in processes of reproduction and transmission, the weaker that

image's potency. To labor over the image by hand slows its circulation (in the case of mass production) and threatens its authenticity (in the case of painting). Yet, all images demand skilled care lest their aesthetic or informative power decline with their reproduction or physical degradation. The modernist image was caught in a double bind, one that demanded a technological solution. AC offered one way to protect an image's appearance from its fragile material base with a minimum of visible manual intervention.

In Benjamin's famous terms, mechanical reproduction signaled the waning of "the age of auratic perception."[108] Not incidentally to my aims in this essay, Benjamin repeatedly characterized aura as an atmospheric phenomenon: a unique weave of space and time linking perceiver and perceived. Media scholars have recently situated Benjamin's use of the term "aura" within its full range of early twentieth-century meanings: its resonance with concepts of milieu, *Stimmung*, and miasma.[109] Aura, in Antonio Somaini's interpretation, is "the diaphanous halo, the haze, the atmosphere surrounding a work of art; an atmosphere whose degrees of density and transparency change with the passing of time."[110] In this context, "aura" does not refer merely to an art object's uniqueness; rather, "aura" describes the unique spatiotemporal tissue that surrounds any individual thing and makes it available to perception. When we stand before a painting, we are linked to it by the "here and now" of that specific encounter while also being acutely aware that we stand in a space where many others, across time and in various locales, once stood before. Through the long and varied history of art conservation, we might expand Benjamin's concept of the "sphere of tradition" surrounding the artwork to include the long history of care that work has received.[111] Aura's waning, then, during the historical crescendo of the mass-produced image may owe less to the literal existence of mass media technology and more to the ideologies and practices of production, circulation, and reception that surround it. If auratic experience waned in the twentieth century, perhaps the fault was not in our art, but in our air.

Notes

1. W. J. T. Mitchell, *What Do Pictures Want? The Lives and Loves of Images* (Chicago: University of Chicago Press, 2005), xiv, 84–86.

2. Nicole Starosielski, "Thermocultures of Geological Media," *Cultural Politics* 12, no. 3 (2016): 300.

3. Mitchell, *What Do Pictures Want*, 84.

4. The source quoted is Simone de Beauvoir's account of her visit to Beijing's Forbidden City in the 1950s. See Alexander Nagel and Christopher S. Wood, *Anachronic Renaissance* (Princeton, NJ: Zone Books, 2010), 7. See also Simone de Beauvoir, *The Long March* (Cleveland, OH: World Publishing, 1958).

5. Louis Althusser, *Lenin and Philosophy and Other Essays*, trans. Ben Brewster (New York: Monthly Review Press, 1971), 109.

6. Eva Horn, "Air as Medium," *Grey Room* 73 (Winter 2018): 6–25; John Durham Peters, *The Marvelous Clouds: Toward a Philosophy of Elemental Media* (Chicago: University of Chicago Press, 2015); Nicole Starosielski, *Media Hot and Cold* (Durham, NC: Duke University Press, 2022); and Yuriko Furuhata, *Climatic Media: Transpacific Experiments in Atmospheric Control* (Durham, NC: Duke University Press, 2022).

7. Starosielski, "Thermocultures of Geological Media," 294.

8. Dipesh Chakrabarty, "The Climate of History: Four Theses," *Critical Inquiry* 35, no. 2 (Winter 2009): 197–222.

9. Museum of Modern Art, "Museum to Be Closed for Five Days for Installation of Air Conditioning Unit," News release, February 28, 1958, https://www.moma.org/research-and-learning/archives/press-archives.

10. Museum of Modern Art, "Museum to Be Closed."

11. Museum of Modern Art.

12. Museum of Modern Art.

13. Museum of Modern Art, "MoMA on Fire," June 2019, moma.org/interactives/moma_through_time/1950/moma-on-fire.

14. Museum of Modern Art, "Rising from the Ashes: Conservation," June 2019, moma.org/interactives/moma_through_time/1950/birth-of-momas-conservation-department.

15. Ken Johnson, "Caroline K. Keck, Art Conservator, Dies at 99," *New York Times*, January 15, 2008, B8.

16. Sheldon Keck, "On Education in Art Conservation," *Brooklyn Museum Bulletin* 19, no. 3 (Summer 1958): 6.

17. Caroline Keck, *A Handbook on the Care of Paintings* (New York: Watson-Guptill Publications, for the American Association of State and Local History, 1967), 62.

18. Keck, *Handbook on the Care of Paintings*, 64.

19. Caroline Keck, "History and Philosophy of Conservation," *Bulletin of the American Group, International Institute for Conservation of Historic and Artistic Works* 5, no. 1 (1964): 2.

20. Paula Hills, "Preface," in Alessandro Conti, *History of the Restoration and Conservation of Works of Art*, trans. Helen Glanville (Oxford, UK: Butterworth-Heinemann, 2007), viii.

21. "The National Gallery Cleaning Controversy," *Burlington Magazine* 104, no. 7 (February 1962), 49–50; and Ernst Gombrich, *Art and Illusion: A Study in the Psychology of Pictorial Representation* (New York: Pantheon Books, 1960): 60–72.

22. Francis Kelly, *Art Restoration: A Guide to the Care and Restoration of Works of Art* (New York: McGraw Hill, 1972), 179–80. For the first "shot fired" in the series of letters, see Gerald Kelly, "The National Gallery," *The Times*, October 30, 1946, 5.

23. "The National Gallery Cleaning Controversy," 49.

24. Keck, *Care of Paintings*, ix.

25. Keck, 37.

26. Keck, 37.

27. Keck, x.

28. Indeed, Keck's husband, Sheldon, participated in such wartime preservation efforts as a member of the Allied armies' program for monuments, fine arts, and archives, a team more commonly known the "Monuments Men." See William H. Honan, "Sheldon Keck, 83, Pioneer in the Field of Art Conservation," *New York Times*, June 17, 1993, D22.

29. Barbara Appelbaum, "Criteria for Treatment: Reversibility," *Journal of the American Institute for Conservation* 26, no. 2 (1987), 65–73.

30. Fernando Domínguez Rubio, *Still Life: Ecologies of the Modern Imagination at the Art Museum* (Chicago: University of Chicago Books, 2020), 147.

31. Rubio, *Still Life*, 49.

32. Rubio, 162.

33. Keck, *Care of Paintings*, 60.

34. Caroline Keck, *How to Take Care of Your Pictures* (New York: Museum of Modern Art and the Brooklyn Museum, 1954), 24.

35. Carol Mancusi-Ungaro, "Landmarks Preservation: Conserving the Monochrome," *Artforum* (Summer 2011), https://www.artforum.com/print/201106/landmarks-preservation-conserving-the-monochrome-28368.

36. Barry James, "Roller Controversy in Amsterdam," *New York Times*, November 2, 1991.

37. Mancusi-Ungaro, "Landmarks Preservation."

38. Mancusi-Ungaro, "Landmarks Preservation."

39. Keck, *How to Take Care of Your Pictures*, 7. This book appeared in several editions. The 1954 edition depicts the two paintings arranged vertically, with the abstract painting on top. The image included in this essay comes from the 1973 edition, where the images appear side by side.

40. Leo Steinberg, "Other Criteria," in *Other Criteria: Confrontations with Twentieth-Century Art*, 2nd ed. (Chicago: University of Chicago Press, 2007), 81.

41. Clement Greenberg, *Art and Culture: Critical Essays* (Boston: Beacon, 1961), 173.

42. Greenberg, *Art and Culture*, 173.

43. Michael Fried, *Art and Objecthood: Essays and Reviews* (Chicago: University of Chicago Press, 1998), 197.

44. Another way of saying "object of aesthetic interest" is to say the object of our judgment. The allusion to Kant here is purposeful: in a footnote to "Art and Objecthood," Fried quotes his friend Stanley Cavell's observation that "for Kant in the *Critique of Judgment* a work of art is not an object." See Fried, *Art and Objecthood*, 170n15.

45. Fried, *Art and Objecthood*, 197.

46. Rauschenberg Research Project, "Conservation Notes relating to Robert Rauschenberg's *White Painting* [three panel] (1951)," San Francisco Museum of Art, 2012, https://www.sfmoma.org/research-materials/whit_98-308_038/.

47. For the history of this reading of the paintings and Rauschenberg's own changing interpretation of them, see Branden W. Joseph, "White on White," in *Random Order: Robert Rauschenberg and the Neo–Avant-Garde*, 25–72 (Cambridge, MA: MIT Press, 2003).

48. Rosalind Krauss, "Perpetual Inventory," in *October Files: Robert Rauschenberg*, ed. Branden W. Joseph (Cambridge, MA: MIT Press, 2002), 106.

49. Hal Foster, *The Art-Architecture Complex* (London: Verso, 2011), 273n1.

50. Sarah Roberts, "White Painting [three panel]," Rauschenberg Research Project, San Francisco Museum of Modern Art, July 2013, https://www.sfmoma.org/essay/white-painting-three-panel/

51. Martha Buskirk, *The Contingent Object of Contemporary Art* (Cambridge, MA: MIT Press, 2003), 14.

52. "After I did the thing called 'art' or whatever it's called, I went into business art." See Andy Warhol, *The Philosophy of Andy Warhol: From A to B and Back Again* (New York: Harcourt, 1975), 92.

53. Quoted in Reyner Banham, *The Architecture of the Well-Tempered Environment* (London: Architectural Press, 1969), 151.

54. Daniel A. Barber, *Modern Architecture and Climate: Design before Air Conditioning* (Princeton, NJ: Princeton University Press, 2019), 10.

55. Banham, *Architecture of the Well-Tempered Environment*, 187.

56. Barber, *Modern Architecture and Climate*, 262. Or, as Eva Horn puts it, "to be 'modern' means to be independent of such negligible things as air temperature or the degree of humidity." Eva Horn, "Air Conditioning: Taming of the Climate as a Dream of Civilization," *Avery Review* 16 (May 2016), https://averyreview.com/issues/16/air-conditioning.

57. Gail Cooper, *Air-Conditioning America: Engineers and the Controlled Environment* (Baltimore, MA: Johns Hopkins University Press, 2002), 29–30.

58. Reyner Banham, *The Architecture of the Well-Tempered Environment*, 174.

59. Cooper, *Air-Conditioning America*, 19.

60. "Indoor Climate," *Journal of the Royal Society of Arts* 83, no. 4325 (1935): 1114.

61. Janet Greenlees, *When the Air Became Important: A Social History of the New England and Lancashire Textile Industries* (New Brunswick, NJ: Rutgers University Press, 2019), 1–14.

62. Marsha Ackerman, *Cool Comfort: America's Romance with Air-Conditioning* (Washington, DC: Smithsonian Books, 2002), 144. Cited in Wolf Boër, "Synthetic Air," *Future Anterior* 13, no. 2 (Winter 2016): 96.

63. Cooper, *Air-Conditioning America*, 24.

64. Most accounts of AC's origin fail to mention that *Judge*'s color illustrations regularly featured racist caricatures, such as a now notorious comic by children's author Dr. Seuss. Brian Boucher, "Offensively Racist Dr. Seuss Drawing Heading to Auction—Why?," *Artnet News*, May 28, 2015, https://news.artnet.com/market/racist-dr-seuss-drawing-auction-302586. Just as color film technology developed according to a racist optics of exclusion, the history of print technology is profoundly entwined with historical processes of racialization.

65. Michael Twyman, *A History of Chromolithography: Printed Colour for All* (London: Printing Historical Society, 2013), 16–19; and Bamber Gascoigne, *How to Identify Prints*, revised 2nd ed. (London: Thames & Hudson, 2004), sections 21a–24b.

66. Twyman, *History of Chromolithography*, 505.

67. Starosielski, "Thermocultures of Geological Media," 300.

68. "Delivering a Climate," *Inland Printer* 64 (March 1920): 704.

69. Twyman, *History of Chromolithography*, 517.

70. Cooper, *Air-Conditioning America*, 25.

71. *The Story of Manufactured Weather, by the Mechanical Weatherman* (Carrier Engineering Corporation, 1919), 48.

72. *The Story of Manufactured Weather*, 35.

73. A. H. Simonds and L. H. Polderman, "Air Conditioning in Film Laboratories," *Journal of the Society of Motion Picture Engineers* 17, no. 4 (October 1931): 605–6.

74. Simonds and Polderman, "Air Conditioning in Film Laboratories," 605.

75. See F. E. Garbutt, "Air Conditioning System for a Modern Film Laboratory," *Heating and Ventilation Magazine* 20, no. 12 (December 1923): 39–44; and William Still, "Fred Gage Creates Great Lab at Warners' Burbank Studio," *American Cinematographer* (March 1938): 105.

76. A. C. Buensod and R. W. Waterfill, "Sensible Use of Refrigerants under the Emergency Now Confronting the Industry," *Journal of the Society of Motion Picture Engineers* (November 1943): 426–31.

77. "Film Shrinkage and Frame Registration," *International Projectionist* 38, no. 8 (August 1963): 4–7.

78. The climate requirements of cinematic production and storage also figure in Nadia Bozak's assessment of cinema's environmental impacts in *The Cinematic Footprint: Lights, Cameras, Natural Resources* (New Brunswick, NJ: Rutgers University Press, 2011).

79. US Department of Energy, "History of Air Conditioning," July 20, 2015, https://www.energy.gov/articles/history-air-conditioning; and American Society of Heating, Refrigerating, and Air-Conditioning Engineers, "ASHRAE History," n.d., https://www.ashrae.org/about/mission-and-vision/ashrae-industry-history.

80. Starosielski, "Thermocultures of Geological Media," 302.

81. Cooper, *Air-Conditioning America*, 45.

82. Cooper, 46.

83. Quoted in Cooper, 47.

84. Cooper, 45.

85. Manuel De Landa, *War in the Age of Intelligent Machines* (New York: Zone Books, 1991), 31.

86. E. P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past and Present* 38 (1967): 71.

87. Thompson, "Time, Work-Discipline," 60

88. As David F. Noble observes, "The same skills that make production possible also make pacing possible." See David F. Noble, *The Forces of Production: A Social History of Industrial Automation*, 2nd ed. (London: Transaction, 2011), 34.

89. Thompson, "Time, Work-Discipline," 71–75.

90. Wilhelm Weber, "Introduction," in *A History of Lithography* (London: Thames & Hudson, 1966), 9–16; and Twyman, *History of Chromolithography*, 505–16.

91. J. Russell Parrish, "Presses and Presswork," in *Printing Progress: A Mid-Century Report*, ed. Clifford L. Herbert, 233–35 (Cincinnati, OH: International Association of Printing House Craftsmen, 1959).

92. Helmut Müller-Sievers, *The Cylinder: Kinematics of the Nineteenth Century* (Berkeley: University of California Press, 2012), 75.

93. This technology lent its name—also in its shortened form, "roto"—to refer to any color newspaper supplement. In *Holiday Inn* (Mark Sandrich, 1942), Bing Crosby sings to Marjorie Reynolds: "On Fifth Avenue, the photographers will snap us / And you'll find that you're in the rotogravure."

94. Parrish cites humidity changes, among other factors, for subtly warping paper rolls and thus introducing uneven web tension into the printing process. Parrish, "Presses and Presswork," 249. On ink viscosity's effect on intercolor register, see Parrish, 236–37.

95. For a summary of many of these methods, along with changes in paper technology that increased the predictable workability of printing stock, see Twyman, *History of Chromolithography*, 517–24.

96. Jane Bennett, *Vibrant Matter: A Political Economy of Things* (Durham, NC: Duke University Press, 2010): 5.

97. Parrish, "Presses and Presswork," 251.

98. Both of these shifts away from manual craft and toward the labor of management correspond to a broader postwar shift in the capitalist West to forms of "immaterial labor." Maurizio Lazzarato, "Immaterial Labor," in *Radical Thought in Italy: A Potential Politics*, ed. Paolo Virno and Michael Hardt, 142–57 (Minneapolis: University of Minnesota Press, 1996). For a rich assessment of the way this shift impacted another segment of the printing industry, typesetting and typographic design, see J. Dakota Brown's pamphlet *Typography, Automation, and the Division of Labor: A Brief History* (Chicago: Other Press Books, 2019).

99. Benedict Anderson, *Imagined Communities: Reflections on the Origins and Spread of Nationalism* (New York: Verso, 1983), 24.

100. Anderson, *Imagined Communities*, 35–36.

101. William Ivins, *Prints and Visual Communications* (New York: Perseus, 1953), 127. Image reproduction also lent its formal resources to modernism's flat, optical image. Ivins's description of the coarse but regular texture of early photomechanical reproduction finds its echo in Greenberg's descriptions of Claude Monet's paintings, which comprise "a multiplicity of identical or similar elements" requiring "every part of the canvas to be treated with the same emphasis of touch." See Clement Greenberg, "The Crisis of the Easel Picture," in *Arrogant Purpose: The Collected Essays and Criticism*, Vol. 2, ed. John O'Brien (Chicago: University of Chicago Press, 1986), 222.

102. Lorraine Daston and Peter Galison, "The Image of Objectivity," *Representations* 40 (Autumn 1992): 120.

103. Caroline Jones, *The Machine in the Studio: Constructing the Postwar American Artist* (Chicago: University of Chicago Press, 1996), 159.

104. Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1991).

105. Caroline Jones, *Eyesight Alone: Clement Greenberg's Modernism and the Bureaucratization of the Senses* (Chicago: University of Chicago Press, 2005), xviii.

106. Grant Bollmer, *Materialist Media Theory: An Introduction* (New York: Bloomsbury, 2019).

107. For an elaboration of the term "cultural techniques," see Geoffrey Winthrop-Young, "Cultural Techniques: Preliminary Remarks," *Theory and Society* 30, no. 6 (2013): 3–19; and Bernhard Siegert, *Cultural Techniques: Grids, Filters, Doors, and Other Articulations of the Real* (New York: Fordham University Press, 2015).

108. Recall his description of aura as "the unique apparition of a distance, however near the thing may be." Walter Benjamin, "The Work of Art in the Age of Its Technological Reproducibility" (second version), trans. Edmund Jephcott and Harry Zohn, in *Selected Writings*, Vol. 3, ed. Howard Eiland and Michael W. Jennings (Cambridge, MA: Belknap, 2002), 104–5.

109. See Antonio Somaini, "Walter Benjamin's Media Theory: The *Medium* and the *Apparat*," *Grey Room* 62 (Winter 2016): 6-41; Miriam Hansen, "Benjamin's Aura," *Critical Inquiry* 34, no. 2 (Winter 2008): 336–75; Inga Pollman, *Cinematic Vitalism: Film Theory and the Question of Life* (Amsterdam: Amsterdam University Press, 2018); and Boër, "Synthetic Air."

110. Somaini, "Walter Benjamin's Media Theory," 16.

111. Thus, we might read the "cleaned paintings" controversy at London's National Gallery as an instance in which a simple haze of yellowing varnish came to represent the sphere of tradition in its entirety.