INTRODUCTION: STUDIOS AND SYSTEMS

 Since the dawn of history men have built cities, some for refuge, some
for defense and some for habitation, but never before in the history of the
world has a city been built expressly for the purpose of making amuse-
ment for the rest of the world. It is the magic city of make-believe and one
never knows, as they stroll about the streets of this city, whether they are
looking at the real or unreal.

—*The Facts and Figures About Universal City* (1915)[1]

BY THE TIME Universal Pictures opened its studio "city" to curious visi-
tors in 1915, the film studio had become a well-known, if still tantaliz-
ingly mysterious, site of cultural production. Universal's "magic city of
make-believe," as promotional materials described it, represented only the
largest version of the hundreds of studios found across the United States
and Europe. As advertisements suggested, the tourists who traversed its
backlot sets on guided tours found unreal city streets bearing the innumer-
able signs of reality that had become studio cinema's stock-in-trade. Like
film viewers, Universal's visitors traveled from Old Western towns to New
York City streets and from ancient Greek agoras to Chinese pagodas with
the immediacy of a film cut. Cinema's impossible on-screen voyages, the
tour revealed, had tangible counterparts in studio-made cities.

To movie-savvy visitors, this likely came as no great surprise. The
popular and trade press had made basic knowledge of studio cinema a
banality of the growing film industry, and studio tours only reinforced
many audience members' assumptions about the real places that produced

film's unreal spaces. In only two short decades, the film studio had already become an assumed feature of—and actively disavowed necessity for—illusionary forms of cinematic representation. But as contemporary observers made clear, to disregard the studio was to miss something profoundly unsettling about cinematic reproduction. Reflecting on the eerie strangeness of the studio's artificial worlds after a tour of Germany's Ufa studios in 1926, Siegfried Kracauer wrote:

> the things that rendezvous here do not belong to reality. They are copies and distortions that have been ripped out of time and jumbled together. They stand motionless, full of meaning from the front, while from the rear they are just empty nothingness. A bad dream about objects that has been forced into the corporeal realm.[2]

Kracauer's "bad dream" well describes the tensions between reality and artifice, meaning and depthlessness, and physical surfaces and the "empty nothingness" behind them that characterized studio cinema from its earliest inception. And yet, like so many others since, Kracauer, in focusing only on the surfaces—the studio sets—that so troubled him, looks past the buildings that structured the meaning and nothingness, the reality and artifice that lay just beyond most audiences' and critics' attention.

Almost a century later, the studio remains a kind of "empty nothingness" in standard film histories. Indeed, the studio may be the most taken-for-granted of the fundamental developments that shaped cinema's earliest years. This despite the fact that in the decade following Universal City's grand opening, film studios would come to define one of the salient aspects of the modern film industry. As filmmaking in America became identified with a place, Hollywood, its business model took its name from a spatial system, "the studios." While the term *studio* continues to serve as a common metonymic substitute for American commercial cinema and a ready identifier for the business entities that dominate popular moving-image culture, such familiarity belies the scant attention that has been devoted to the studios' pre-Hollywood origins or to their architectural forms and functions in any period.

Studio architecture—the always present but rarely visible frame that lies just beyond the visual field of studio films—has played a key, but

rarely acknowledged, role in the history of filmmaking. Cinema's first architectural forms shaped early film form by helping determine lighting quality, shooting angles, and set sizes. They contributed to film content by housing workshops for set, prop, and costume design; storage depots; dressing rooms; and writing departments. Their physical layouts shaped filmmakers' working practices by creating spatial relationships between different phases of production. And they conditioned cinema's early industrial practice in the first darkrooms, editing and coloring ateliers, and printing facilities.

Studio practices also went beyond film production. Especially at the largest companies, studios often included factories for manufacturing film devices and housed research and development laboratories for developing both film and non-film technologies. Such spaces made studios important sites of interaction between film professionals and workers from diverse industries, from theater and vaudeville performers to scientists and engineers. In this way, studios became important nodes in the intellectual, cultural, and political networks through which the young film industry entered the modern world. And as studio tours like Universal's, studio photographs in the trade and popular press, and "behind-the-scenes reports" like Kracauer's made studios part of public discourse about film culture, their architectural forms helped cultivate ideas about the industry they housed. In sum, while we tend to think of studios simply as places in which to make films, such a narrow view has helped obscure the studio's fundamental importance to film history.

This tendency to overlook the studio is especially surprising given that film historians have long been aware of individual studios' basic details. Thanks in part to early filmmakers' efforts to stake out their place in the medium's invention by writing their own histories, the first descriptions of the studios date to the era of their creation.[3] The first amateur and professional film historians also paid due attention to the studios as part of an effort to catalog the inventions and industrial practices that led to modern cinema.[4] But just as they characterized early cinema as little more than the rudimentary training ground for Hollywood and interwar European classicism, these historians seldom treated the studios as anything more than the "primitive" precursors to more modern replacements.[5]

More recent histories have done little to change that view. Historians have recuperated early cinema as not simply a precursor to modern cinema but as a rich period of film history in its own right, with diverse production, distribution, and exhibition practices, aesthetic forms, and models of viewing and experiencing moving images.[6] This book does something similar for the studios. While the importance of exhibition contexts, audience experiences, and spectatorial identities—key points of revision in early film history that also countered the authority of apparatus and psychoanalytic film theories in the 1970s—must not be ignored, their place in early film historiography has tended to turn our attention away not simply from the apparatus but from early film production altogether. Rather than revalorizing the apparatus, however, this book takes a middle path that rejects technological determinist approaches to film history while nonetheless highlighting the important role that film technologies and production spaces have played in shaping film texts and cinematic culture.[7]

It does so, in part, by emphasizing the diverse ways that film studios worked. To encapsulate the many practices they housed in cinema's first two decades, I define studios broadly as structures designed for moving-image production, including the pre- and postproduction, research and development, manufacturing, marketing, and publicity practices that tended to develop alongside studio stages.[8] While all studios included space for recording films, this definition insists upon the importance of the many non-shooting and even non-film-specific activities that shaped studios' working practices. It also captures the diverse material forms that studios took before momentarily settling into a relatively standard model in the United States and Western Europe in the mid-1910s.

I focus on studios built by six of the largest American and French producers—the Edison Manufacturing Company, American Mutoscope and Biograph, American Vitagraph, Georges Méliès's Star Films, Gaumont, and Pathé Frères—as well as companies including Selig Polyscope and the American Film Manufacturing Company that built the first studios in Southern California. Although not all-encompassing, their studios are representative of the major spatial precursors, design elements, building materials, and working practices that shaped studio cinema in its first two decades.[9] They run the gamut of early studio

design, from wooden stages built in gardens, parks, and on city rooftops to experimental rotating structures, greenhouse-like glass enclosures, and large factories built in brick and reinforced concrete.[10] Their studios are significant, in part, because these companies were among the first and most successful in the prewar era. But I will also argue that companies like them became successful in no small part because of the significance of the studios they built.

A SHORT HISTORY OF FILM STUDIOS TO 1915

Like early moving-image technologies, studios appeared first in the eastern United States, France, Germany, and the United Kingdom. They developed in a similarly independent fashion, driven by designers—initially filmmakers themselves—likely working without direct knowledge of their competitors' models but drawing on related influences. Within two decades, studios based on similar material and spatial designs would be found across the United States, from New York, Philadelphia, and Chicago, south to Jacksonville and San Antonio, and west to San Diego, San Francisco, and Los Angeles. Similar structures emerged in European countries including Italy, Russia, Spain, Sweden, and Denmark, and studios could also be found in Brazil and Japan.

The world's first studio predates the first Lumière screening by almost three years. Built by W. K. L. Dickson and commonly known as the "Black Maria," it housed Edison Company film productions in West Orange, New Jersey, from early 1893. By 1897, film companies had opened studios in New York City, Philadelphia, Berlin, and on the outskirts of Paris. In New York, the Vitascope Company organized an open-air studio on the roof above its offices at 43 West 28th Street in 1896, and early the following year Dickson built an open-air, rotating studio on the rooftop of 841 Broadway, home of the American Mutoscope and Biograph Company's offices.[11] The following year, American Vitagraph organized a rooftop studio above its top-floor offices in the Morse Building at 140 Nassau Street and Siegmund Lubin established his first studio on a Philadelphia rooftop.[12] Around the same time, in Berlin, Oskar Messter established a rooftop studio enclosed in glass.[13] And in late 1897, Georges Méliès built

France's first studio—a stand-alone glass-and-iron structure—in the eastern Parisian suburb of Montreuil-sous-Bois.

Within five years, the major American, French, and British companies had all built their first studios, most using glass-and-iron forms similar to the first Méliès studio. R. W. Paul and the British Mutoscope Company built the first English studios in 1898. Paul's studio, located in the London suburb of New Southgate, featured a glass-roofed stage with sliding doors positioned opposite a separate camera platform mounted on wheels (fig. I.1).[14] British Mutoscope built a Dickson-designed rotating studio in London near the Tivoli Theatre and Charing Cross Station.[15] Other early British studios included G. A Smith's at St. Anne's Well and Wild Garden in Brighton (1899), Cecil Hepworth's studio in Walton-on-Thames (ca. 1900), James Williamson's studio in Brighton at Cambridge Grove (ca. 1902), and A. C. Bromhead's studio, built with backing from Gaumont, in Southwest London at Loughborough Junction (ca. 1902–1904).[16]
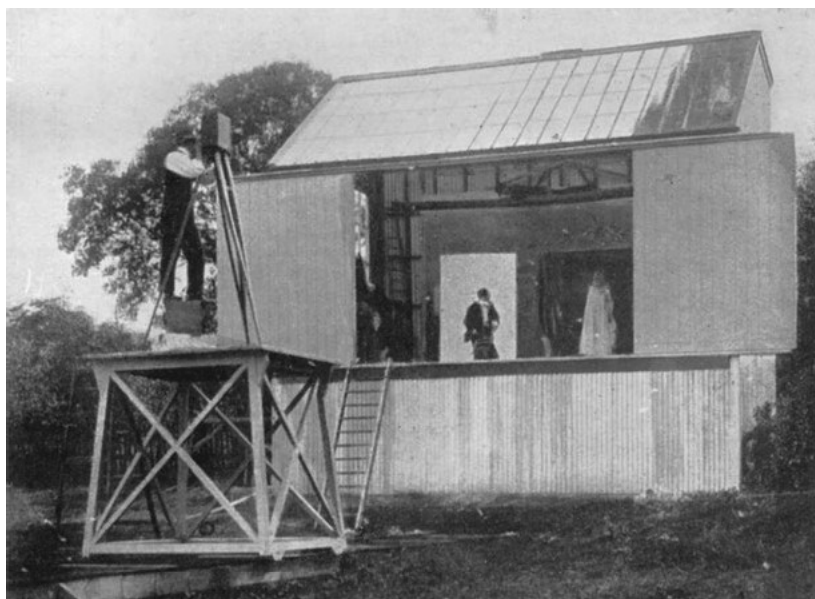

FIGURE I.1 R. W. Paul Studio (b. 1898). From Frederick A. Talbot, *Moving Pictures: How They Are Made and Worked* (rev. ed., 1912), n.p.

In the United States, Edison replaced the Black Maria in 1901 with a new glass-enclosed studio at 41 East 21st Street in Manhattan. Late the following year, American Mutoscope and Biograph began preparations a few blocks away at 11 East 14th Street for the world's first studio lit entirely by artificial means. Pathé Frères had begun production on an open-air garden stage in winter 1897–98, but by 1902 it had also built a glass studio just outside Paris in Vincennes. Gaumont similarly began production on a small stone terrace in 1898 but covered it in glass by 1902.[17] And in the northwestern Paris suburb of Asnières, Auguste Baron built a glass-and-iron studio where he may have recorded sound films as early as 1898.[18] Finally, in Germany, Oskar Messter moved from his rooftop structure to a glass studio in Berlin circa 1905.[19]

Beginning around 1903, film companies began to devote greater resources to their production infrastructure and often entrusted studio designs to professional architects. At the larger companies, this meant more and larger studio stages, new material forms and technologies to enhance studio lighting, and new attention to organization within and between buildings to facilitate efficient industrial practice. In France, Pathé and Gaumont led French cinema's industrialization by dramatically expanding their studio bases. Pathé built a new studio in Montreuil (close to Méliès's studio) in 1904 and added extensive studio and manufacturing facilities in Joinville-le-Pont in 1906. Gaumont built a glass-enclosed studio in 1904 that would be one of the largest in the world before World War I. Over the next decade, Gaumont built its *Cité Elgé*—more than two dozen buildings housing facilities for all phases of film production and distribution, research and development, and manufacturing—around this central production stage. In an effort to close the growing gap between Star Films and these larger competitors, Méliès added a second studio to his Montreuil estate in 1907.

Similar degrees of growth could be found in the United States. In 1905, Vitagraph began a substantial construction project in Brooklyn's Flatbush area. Within five years the site included three production studios enclosed in experimental forms of glass and with electrical lighting systems as well as extensive ateliers and manufacturing facilities for pre- and postproduction work. Responding in part to Biograph and Vitagraph's studio-supported market growth, Edison built another new

studio beginning in 1905. The company moved north to the Bronx, where it could obtain enough cheap land to expand its facilities, which included multiple large production stages enclosed in glass and supplemented by electrical lighting. In 1912 Biograph traded its electrically illuminated studio for a new studio in the Bronx, again with larger glass-enclosed and electrically lit stages.[20]

Sizeable studios also appeared in Chicago and Philadelphia. In Chicago, the Selig Polyscope Company built a large studio at the corner of Irving Park Road and Western Avenue in 1907 and enlarged it in 1911.[21] Essanay built its first studio at 62 North Clark Street in 1907, moved to a larger facility at 1055 Argyle Street in northern Chicago in 1909, and added an additional building to the latter site in 1913.[22] In Philadelphia, Siegmund Lubin built a new studio with electrical lighting at 926 Market Street in 1907, then moved to a larger facility that came to be known as "Lubinville" at 20th Street and Indiana Avenue in 1910 (fig. I.2).[23] In 1914, Lubin moved again, this time to a 500-acre estate known as "Betzwood," located northwest of Philadelphia.[24]

By the early 1910s, the largest studio factories found at Vitagraph, Gaumont, and Pathé were competing with new studios across Europe and dozens of smaller studios built by companies hoping to profit from
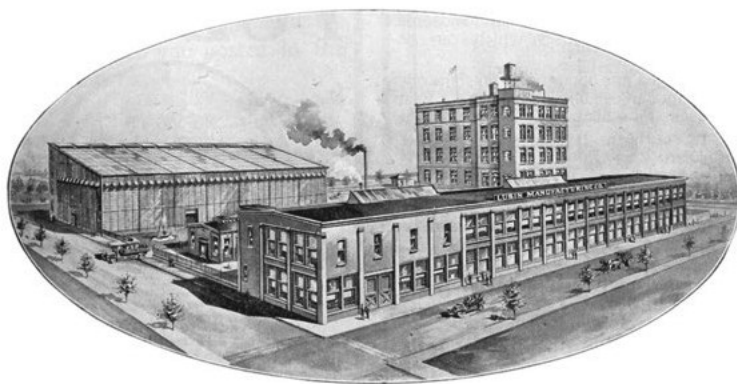

FIGURE I.2 Lubin Manufacturing Company, Philadelphia (*Moving Picture World*, March 26, 1910)

expanding exhibition markets. Studios dotted the suburbs around Paris, including Lux's studio in Gentilly (1907), Éclair's in Epinay-sur-Seine (ca. 1906–1908), Eclipse's in Boulogne-sur-Seine (1908), the Film d'art studio in Neuilly (1908), the Société des auteurs et gens de lettres studio in Vincennes (1908), and a short-lived studio built by Raleigh & Robert in Montreuil in 1909. Nordsk Films Kompagni built a glass studio in the Copenhagen suburb of Valby in 1907, and the same year the Drankov Company built the first Russian-owned studio.[25] Finally, the studios that would later house Germany's Universum Film AG began to take shape around 1912 when Projektions Union built new studios at Tempelhof.[26]

A range of appellations and associations were used to describe these new buildings, which regularly defied conventional architectural and aesthetic expectations. The term "studio" appeared as early as the first accounts of the Black Maria, but other common descriptors included "theatre," "plant," and "factory."[27] In France, the English "studio" was not well established until the 1910s; instead, commonly used terms included "théâtre de prises de vues," "théâtre de poses," simply "théâtre," and "atelier" or workshop. Like their English-speaking counterparts, the French also described studios as "usines" (factories).

No matter what they called the studios, observers often went to great lengths to associate them with more recognizable visual forms. Attempts to clarify studio aesthetics began with the Black Maria. In addition to its now standard name—a term for late-nineteenth-century police vehicles— other points of comparison included coffins and caverns, and in their account of the studio, W. K. L. and Antonia Dickson compared it to "the unwieldy hulk of a medieval pirate-craft or the air-ship of some swart Afrite."[28] While few studios seemed as strange as the Black Maria, writers rarely failed to emphasize their novelty. Even as late as 1908, one journalist could still note about Edison's new production facilities in the Bronx that "the odd looking structure attracts the attention of every passerby, while comments upon its probable use are varied and often ludicrous. Some are sure it is an electric power house . . . others think it is a dynamite factory."[29] And a 1916 *Los Angeles Times* article could joke that "the outside of a movie studio looks like a class A baseball park, and the inside looks like a remnant sale of a Kansas cyclone."[30]

Common naming conventions and the less imaginative associations that observers drew between studios and contemporary sites like factories go some way toward explaining where film's first production spaces fit in turn-of-the-century architectural norms. But where did studio designs and styles originate? What architectural forms inspired the first studios' material and structural forms and functions? And how did their forms affect the forms of the films produced in them? This book argues that early cinematic space was the product of a confluence of architectural influences and spatial precursors derived from nineteenth-century developments in architecture, building technology, and urban infrastructure. In shaping cinema's physical production sites, its virtual film worlds, and, as others have argued before, its viewing practices, those developments played a fundamental role, not only in the emergence of cinematic space, but more generally in the formation of cinematic culture.

THE EMERGENCE OF CINEMATIC SPACE

However odd they might have looked, the first studios were neither rudimentary nor haphazardly designed. Indeed, the first buildings for cinematic production were as much the concrete product of a cinematic imagination as the films produced there. In order to generate imaginary worlds *on* film, filmmakers had to create new worlds *in which* to film. To do so, they necessarily looked outside the new world of cinema to spaces and spatial models that included "topoi of modernity" like those that, as Giuliana Bruno and Anne Friedberg have shown, helped define the spaces and practices of early film viewing.[31] Just as cinematic time, as Mary Ann Doane has described, emerged as part of "a more general cultural imperative" that structured ideas about and practices associated with modern temporality, so the emergence of cinematic space both followed and contributed to broader processes of spatial production and efforts to understand the new spatial experiences of urban industrial modernity.[32] Studio designers drew inspiration from a range of nineteenth-century building types, including photography studios, theatrical stages, scientific laboratories, hothouses, factories, and mills. Borrowing from these sources, filmmakers and architects conceptualized a new type of architectural,

industrial, and artistic space that would shape the future content and form of moving images and help transform modern visual culture within and beyond the studio's walls.

Early studio designers took inspiration from spaces with three principal qualities: luminosity, plasticity, and precision. First and foremost, they replicated existing spaces of visual cultural production, especially photography studios. The first rooftop stages, whether open air or enclosed in glass, strove for the same access to light that motivated urban photographers to take transparent shelter above the city beginning in the mid-nineteenth century. As I discuss in chapter 1, Dickson most likely modeled the Black Maria on stand-alone photography studio designs outlined in contemporary books such as Matthew Carey Lea's *A Manual of Photography* (1868) and Henry Peach Robinson's *The Studio and What to Do in It* (1891). In his capacity as laboratory photographer, Dickson would have been familiar with these spaces, and indeed he built a photography studio at Edison's West Orange laboratory in 1889 and conducted early moving-image tests in it before moving to the Black Maria.

Méliès similarly drew on photography studios in his design for cinema's first glass house. Although most commonly compared to his Robert Houdin theater, Méliès's studio was just as likely inspired by the photography studio on the Robert Houdin's roof. Originally built by André-Adolphe-Eugène Disdéri (inventor of the *carte de visite*), the studio was the largest in Paris at the time of its opening in 1854. Four decades later, in 1895, a photographic portraitist and former Lumière factory employee named Clément Maurice took over the studio, where he continued to do work for the Lumières and often met with Méliès. As I describe in chapter 2, while Méliès may have reproduced the tricks and stage setups used in his theater, the studio bore closer material and functional likeness to the Disdéri-Maurice studio.

Much as they did for portrait photographers, photography studios offered early filmmakers a working prototype for developing the well-lit spaces they needed, first for rapid exposures, then for longer working hours. They also provided concrete models of spatial plasticity. The painted backdrops with which studio photographers produced a variety of interior and exterior locations prefigured the same strategy by which studio filmmakers learned to transform their working spaces into an

endless array of virtual worlds for the screen. Thus while the backdrops and tableau format used in theatrical staging no doubt influenced early studio production, strategies for creating the studio's spatial plasticity also had roots in earlier photographic recording spaces.

Bright light may have been the dominant requirement for early studios, but not just any light would do. Studio filmmakers also depended on precise control of the filmmaking environment. Dickson's design for the Black Maria underscores this need for controlled spaces. By mounting the studio on wheels and a circular track, Dickson responded to the photographic studio's initial inadequacy for film production. Dickson needed more than just light; he needed well-regulated light and the more legible images it produced. Other filmmakers demanded similar, if less strict, degrees of control in their studios. Méliès, for instance, draped thin layers of fabric beneath his glass enclosure, a strategy that filmmakers would reproduce well into the 1910s to diffuse light and eliminate sharp shadows.

By the early 1900s, studio architects were building such requirements into their designs. They used combinations of older and cutting-edge materials to shape studios' light spaces according to emerging norms for studio recording. They also took inspiration from other light-dependent spaces that offered new models for creating bright, controllable, and flexible working environments. In particular, studios came to look and operate more like factories and mills, not only on the assembly lines that turned out cameras and projectors but also on studios' growing production stages. As I describe in chapter 3, the introduction of electrical lighting in the early 1900s offered new degrees of luminosity and precision, while new building materials including reinforced concrete, steel, and prismatic glass allowed architects to increase solar illumination (much as they did in modern factories) and expand stage sizes without the need for the internal support columns that might block camera angles or cast unwanted shadows.

As studios increased in size and expanded to multiple buildings, architects organized stages, dressing rooms, design ateliers, storage rooms, and processing facilities with an eye to maximizing efficiency. Chapter 4 examines how luminosity spread from the stage to specialized set design workshops and how the precision seen on set spread out to include the

movement of workers, set pieces, props, and film stock. That expanded, architecturally conditioned precision came to define the studios' new industrial organization. Cinema's capitalization, this chapter shows, had an important spatial component that can be read in the blueprints and studio maps that gave these principles visual form.

Finally, the same desires for luminosity, plasticity, and precision that produced the first studio designs also drove filmmakers' work beyond the studio walls. As I discuss in chapter 5, as filmmakers left their urban studios in the late nineteen aughts for seasonal filmmaking trips south and west, they applied studio-shaped ideals about film space to exterior shooting sites. Companies like Kalem developed mobile studio setups designed to create on-site versions of studio control. Such efforts to transport studio principles to non-studio locations achieved fullest expression in director Romaine Fielding's "Collapsible Studio," a modular structure designed to allow film crews to generate studio conditions on any site within hours. But even those who did not seek to reproduce studio-like spaces still looked upon the landscape with studio practices in mind. Describing the filmmaking possibilities at a Los Angeles–area location, for instance, one critic noted that it offered "one of the greatest storehouses of beautiful outdoor moving picture backdrops in Southern California."[33] The common idea that natural settings were like studio supply closets helped shape the emerging concept of "location" and gave rise to the early studio backlot.

The first studios' complex architectural forms and diverse spatial inspirations contributed to the equally sophisticated character of early films. While studio designs and studio filmmaking almost always endeavored to remove any direct trace of the studio frame from the filmed image, studio forms had direct, and sometimes easy to identify, effects on their film products. I trace these formal developments from what I term the "framed aesthetic" of the Black Maria and similar Dickson-designed studios (chapter 1), to the fluid and "plastic" forms produced in the first glass-and-iron studios (chapter 2), to the cinematographic innovations and increased realism engendered by the large studios of the Nickelodeon era (chapters 3 and 4), and, finally, to the studio-inspired formal techniques by which filmmakers captured natural landscapes and backlot sets (chapter 5).

Different strategies for producing studio luminosity generated visibly distinct film spaces. The Black Maria's precise illumination, for instance, defined its unmistakable "framed aesthetic." By the early 1900s, competing architectural forms using different combinations of electrical and glass-mediated natural lighting created a hierarchy of visual quality that did not escape the audiences or critics whose aesthetic judgments often came in direct response to studio developments. Studios' plastic, controlled spaces contributed to filmmakers' early experiments with film space, especially in the first glass-and-iron studios in which Méliès, Edwin S. Porter, G. A. Smith, Ferdinand Zecca, and others developed film's first special effects. Méliès's first studio, for instance, gave him the consistency and control necessary to develop and refine his subsequently famous tricks. More conceptually, his film tricks came to function much like his studio's transparent glass enclosure, which worked—much as Giuliana Bruno has described the effect of urban glass architecture—"[to explode] the division between interior and exterior in favor of a fluid light space."[34] Finally, larger stage sizes, enhanced control of studio lighting, and the orchestrated movement of sets, props, and players from staging areas to shooting stages contributed to new forms of studio-style realism in longer multi-shot films. In sum, while the studio's role in shaping film form was by no means all determining, shifting studio designs set limits on and created new possibilities for film space, and they have never ceased to do so.

By the 1920s, filmmakers, architects, and theorists would make architecture's close relationship to cinema a common refrain. As René Clair most famously remarked, "the art that is closest to cinema is architecture."[35] Clair encapsulated similar ideas expressed by innumerable contemporaries, from Abel Gance, Sergei Eisenstein (a trained architect), and Siegfried Kracauer (also an architect) to the architect and set designer Robert Mallet-Stevens, art historian Elie Faure, and Le Corbusier.[36] This attention came, in part, as a result of the numerous and practical interactions between architects and filmmakers that arose in the context of expanding studio production and modernist intermedial experimentation. Architects built enormous film sets and commissioned filmmakers to document modern architecture's novel forms. Filmmakers used modernist buildings as filming locations while also debating the vices and virtues of studio versus location shooting.[37] And early critics and theorists of

modernism explored the similarities between filmmakers' and architects' treatments of space.

As I demonstrate in what follows, these ideas and interactions were nothing new. In the previous three decades, a long list of since-forgotten architects had come to play a critical role in film production. They included the likes of Hugo Kafka, a Czech-born immigrant and student of Gottfried Semper, who brought film architecture to the Bronx at Edison's 1906 reinforced concrete and glass studio; Arthur Rendle, a prize-winning exposition architect and patent holder in glazing techniques, who designed Edison's glass enclosure; Auguste Bahrmann, a Paris-based residential and industrial architect who orchestrated the dozens of buildings that became Gaumont's Cité Elgé; Eugène and André Laubeuf, the latter a graduate of the École National des Arts et Métiers, who worked on rail stations for the Chemin de fer de l'Ouest and studio buildings for Pathé in Vincennes; and Théodore-Léon and Georges Moisson, the latter an École des Beaux-Arts graduate, who built Pathé's compound in Joinville-le-Pont. While their better-known counterparts in the 1920s have made interactions between the two arts cause for celebration and analysis, it was these more anonymous precursors who first defined cinema's relationship to architecture.[38]

CINEMA, TECHNOLOGY, AND NATURE

> Art and technology represent two different ways of shifting the boundaries
> of visuality . . . by either misusing or circumventing the sun.[39]
> —Friedrich Kittler

The filmmakers and architects who defined cinema's early relationship to architecture drew on developments in building technology that were changing the character of the modern built environment. Studio architects used the same glass and iron that had been part of the reconfiguration of Western urban spaces since the mid-nineteenth century as well as the newest materials and designs that were modernizing cities like New York and Paris.[40] In doing so, they made cinema part of a broader series of changes that historians of technology have characterized as the construction of

a "human-built world." In what follows, I use this concept as a way of framing the studio's—and early cinema's—relationship to the built environment of modernity and, more broadly, the technological changes that conditioned cinema's emergence.[41]

Studio architects and those who were reshaping modern cities shared the need for better regulated architectural spaces. They strove for what Reyner Banham has termed "well-tempered environments," architectural spaces designed to produce suitable climates by regulating natural environmental conditions. The first studios were built in what Banham terms the "selective mode," designed "to expel unwanted conditions from within and to admit desirable conditions from without."[42] Méliès's glass house, for instance, used its combination of transparent and diffusing glass and hanging fabric to admit a desirable form of natural light while also blocking light that was too bright and expelling heat through open glass frames. It was this architectural formation that made Méliès, as Apollinaire fittingly put it, an "alchimiste de la lumière."[43] The ability to manipulate light through the same selective process would characterize studio architecture's well-tempered environments well into the late 1910s.

Dickson's Black Maria produced a more radical version of this architectural selection. Its retractable roof admitted sunlight, while the remainder of the studio barred light that might corrupt film exposures. By mounting the studio on its rotating track, Dickson enhanced the building's selective function, allowing it not simply to admit desirable conditions but to secure the most desirable ones. In synching it with the sun, Dickson highlighted the studio's—and cinema's—paradoxical relationship to the natural environment. Cinema depended on nature—in the interaction of sunlight and the light-sensitive materials it activated—even as studio architects and engineers sought to dissociate filmmaking from the natural world by selecting, manipulating, and/or simulating its desirable features. As Kittler might have put it, they found better ways to misuse or circumvent the sun.

In the first decade of the twentieth century, the studio's selective mode achieved heightened degrees of complexity thanks to new architectural designs for open interior spaces that were supported by modern building materials. The introduction of artificial lighting allowed many studios to assume what Banham has termed the "Regenerative mode," an

architectural form in which applied energy is used to regulate the natural environment.[44] Studio lighting and climate control units, almost always used in combination with features of the selective mode, allowed architects to produce more manageable studio environments by simulating sunlight and eliminating rain, wind, snow, heat, and cold—except, of course, in the controlled, artificial forms that filmmakers used to produce illusionary cinematic worlds.[45]

In tempering the natural environment in this way, early studios made cinema a key component of the "human-built world." Defined as the process in which modern technologies came not so much to dominate the natural environment as to replace it with artificial alternatives, the idea of the human-built world has guided efforts to rethink the history of Western technological change.[46] Arguing against the idea that the Industrial Revolution was the epochal shift that defined modern existence, historians have situated technologies including electrical lighting, the internal-combustion engine, airplanes, wireless communications systems, synthetic chemicals, and new consumer objects, from the bicycle and chemical dyes to the telephone, camera, and phonograph, in a longer history of technological developments that coalesced in the early twentieth century to transform everyday life in the West. As Rosalind Williams argues, "never before nor since has there been such a concentrated period of technological change affecting ordinary people."[47]

This book argues that cinema, despite being almost entirely absent from these histories, must be understood as one of this process's most significant technologies.[48] Indeed, film studios and studio films should be seen as quintessential human-built worlds. In their new studios, filmmakers produced not simply films, but artificial worlds that were on par with the synthetic spaces of the modern built environment. They made architectural and technological change the stuff of early cinema, not only in urban actualities but also in studio films that re-created the modern built environment and its infrastructural features, often in order to produce incisive commentaries about their potential dangers. And they contributed to the destabilization of ostensibly clear distinctions between nature and technology and between reality and artifice.

A remarkable photograph of Gaumont's first shooting stage illustrates this kind of destabilization in action (fig. I.3). Gaumont's set designers

FIGURE I.3 Gaumont's first stage with set designers (ca. 1897). (Cinémathèque française, Bibliothèque du film, Service Iconographique)

pose proudly in front of a painted backdrop that depicts a wooded scene, supplemented by a small artificial bush that leans against one of the designers' legs. A small gap between the suspended canvas and the top of the photo reveals real trees that seem to escape from the painting itself, as if nature and artifice were on a continuum rippling at the frame's edge. In its reproduction of a forest that seems to lie just beyond the set, this backdrop underscores the ways that studio filmmaking, from its earliest incarnations, so often produced cinema as the reproduction of the natural environment outside. This re-creation of nature in artificial form marked a seemingly contradictory but common early step in studio production. The need for environmental and spatial control drove filmmakers to dissociate production from the realistic spaces of nature and location shooting, only then to turn to studio technologies to reproduce ever more realistic versions of the places they left behind.

The studio's role in producing these kinds of contradictions has not been lost on film theorists. Walter Benjamin, for instance, underscored this paradoxical production of reality through a naturalistic metaphor. "In the studio," he writes,

> the mechanical equipment has penetrated so deeply into reality that its pure aspect, freed from the foreign substance of equipment, is the result of a special procedure, namely, shooting from a particular camera set-up and linking the shot with other similar ones. *The equipment-free aspect of reality here has become the height of artifice*; the sight of immediate reality has become the 'blue flower' in the land of technology.[49]

Benjamin's "blue flower," as Miriam Hansen explains, refers to the German Romanticist "*blaue Blume*," a metaphor for "the unattainable object of the romantic quest."[50] For Benjamin, the studio makes "immediate reality" the unattainable object. Ensconced within technology, the real becomes more artificial than fiction itself, accessible only, and paradoxically, through the camera's lens, the single location from which one can imagine the artificial scene free of illusion.

This book places these kinds of readings of studio artifice in a broader theoretical framework drawn from the history of technology. It uses the idea of studios as technological systems for environmental control and films as human-built technological worlds to offer a speculative rereading of cinema's ontology through noncinematic theories of technological change. In short, it proposes that we understand cinema as a technological form of environmental regulation and reproduction that made film a kind of virtual world long before the "virtual age" and should push us to understand cinema's early role in the widespread, machine-made changes to the natural environment that have become such cause for concern today.[51]

By the 1930s, cinema's complex status as a technology, its place in the "machine age," and its unique relationship to nature had become part of broader technological discourses. Lewis Mumford, for instance, classified cinema and photography as "specific arts of the machine," an enticing, if underexamined fragment of his sweeping history of technology.[52] For Mumford, the emergence of cinema marked not only a reshuffling

of modern notions of time and space but also new and contradictory possibilities for experiencing nature technologically.[53] Lamenting that "it has been so stupidly misused," Mumford proposes that "the motion picture nevertheless announces itself as a major art of the neotechnic phase. Through the machine, we have new possibilities of understanding the world we have helped to create."[54] Mumford's view of cinema in many ways echoed contemporary thinkers such as Kracauer, Béla Balázs, and Benjamin, particularly their emphasis on film's epistemological potential for accentuating human perception, for instance in Benjamin's idea of the "optical unconscious."[55]

But Mumford's analysis also suggests a less tangible and more provocative potential in cinema's reproduction of the lived world. In response to film's presentation of "the direct and immediate experience of living itself," he proposes that "we must directly see, feel, touch, manipulate, sing, dance, [and] communicate before we can extract from the machine any further sustenance for life."[56] In one sense, Mumford was simply repeating a common (and still persistent) warning about the dangers of accepting technological substitutes for lived experience. "The machine is worthless," Mumford insists, "indeed it is actually debilitating."[57] But more than simply a call to reject technological mediation altogether, Mumford also suggests that cinema might unlock a hidden, vital potential in modern technology. At the moment, in Mumford's view, when machines threatened to replace nature with manufactured alternatives, cinema and photography offered a last chance to encourage new forms of liveliness between human beings and the natural world.[58]

In this respect, Mumford seems to have shared Benjamin's sense that film might counteract other technologies' damaging effects on nature. As Miriam Hansen has argued, Benjamin saw in cinema the possibility for a new form of "interplay between nature and humanity" based on film's capacity "to reverse, in the form of play, the catastrophic consequences of an already failed reception of technology."[59] By "nature," Benjamin did not, of course, imagine—nor does this book—a pure environment sealed off from the forces of history.[60] Rather, he recognized that industrial capitalism had already come to dominate both the natural world and its meaning. Cinema, he hoped, might counteract the latter as part of a broader reformation of humanity's relationship to the material world.[61]

Mumford and Benjamin were not alone in recognizing new potentials in technology to extract something typically unseen from nature. At the same moment, Martin Heidegger was formulating a theory of technology with an equally compelling vision of its relationship to the natural environment. In addition to being a specific machine art, cinema should be understood as an exemplary instance of what Heidegger would theorize under the similarly inflected category of "modern technics" and the modern attempt to conquer the world as an image. For Heidegger, as for Mumford, the condition of modern technics was characterized by a shift in the relationship between nature and technology.[62] Whereas premodern technologies sought to work around nature's limitations, modern technologies fundamentally alter our conception of the natural environment by changing its nature through reordering. Heidegger distinguishes between the wooden bridge that provides passage over the Rhine without altering its flow and the hydroelectric plant that, in halting its flow, changes the very essence of the river, placing it on reserve for exploitation.[63] Heidegger's view that modern technologies dominate the natural environment differs significantly from Mumford's more optimistic analysis of technology as a human-built alternative to nature and his hope that film and photography might revitalize humanity's relationship to it. And indeed, as Anne Friedberg notes, Heidegger offered no more optimistic a view of modern media, which he believed threatened to destroy the senses.[64]

But Heidegger also argues that this alteration carries a crucial representational function—"the conquest of the world as picture."[65] The natural environment reserved for human use is also ordered for representation, framed and set before the human subject as an image.[66] In this respect, Heidegger offers an important way of thinking about film technologies that complements my understanding of cinema as a component of the artificial reproduction of nature in modernity. The film studio serves precisely this function of ordering nature to produce a well-tempered environment for reproduction. As Samuel Weber describes, Heidegger fittingly terms this process *enframing* or *emplacement* (*Gestell*), a term that captures the spatial character of modern technology's manipulation of the natural environment.[67] For Heidegger, the notion of the frame, or enframing, may never have been more, as Friedberg argues, than "a metaphor for the 'enframing' implicit in modern thought and experience."[68] Even so, it

offers a powerful metaphor for cinema's technological function, especially the studio's forms of environmental regulation. As I describe in chapter 1, the studio was a machine for enframing the world and placing it on reserve for the production of moving images. Filmmakers used film technologies to order and reorder nature by enframing it in the camera lens, on the celluloid strip, and on the editing table, before sending it off to be reframed in projection and, metaphorically, in the subjective experience of viewing.

This book analyzes cinema's—and especially the film studio's—role in this reordering of nature as an image in industrial modernity both in Mumford's terms, as a prototypical example of an artificial technological environment, and in Heidegger's, as a technology for rendering the world as picture. By emphasizing Mumford's rare invocations of cinema and pushing Heidegger's metaphor of *enframing* beyond technologies to include technological representations, I want to underscore the value of creating better dialogues between the histories and theories of technology and cinema that I address in historical terms more generally. I explore the film studio's dynamic history as the product of a range of architectural traditions, technological developments, and filmmaking needs. And I emphasize its uniquely heterogeneous status as a filmmaking site, an architectural form, and a technological space. In doing so, I hope not only to close the gap between disciplines and methodological approaches but also to create space for further theoretical and interdisciplinary explorations of the relationships between space, place, architecture, technology, and cinema.

The importance of these relationships remains as poignant as ever today as virtual reality, networked societies, artificial intelligence, cloning, and genetically modified food make fears about technological reproduction and artificial environments ever-present in the news media and popular culture. Just as the first film studios provided an important site for both creating and evaluating artificial worlds, so moving-image media and their production spaces continue to be key spaces and tools for imagining our technological future. We would do well to remain attentive not only to those imagined futures but also to the technologies with which we imagine them.