Engineering, Photography, and the Construction of Modern Paris, 1857-1911

by

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ABSTRACT

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"Engineering, Photography, and the Construction of Modern Paris, 1857-1911" investigates the photographic practices of state civil engineers in the construction of public works in Paris during the Second Empire (1852-70) and the early Third Republic (1870-1940). It contends that Paris became expressly modern by means of a physical transformation that was inseparable from new modes of publicity arising in concert with technologies of representation and reproduction. Photographs commissioned in many building campaigns supervised by state engineers functioned as exemplary documents of rationalized urban management used to remotely monitor site conditions, construction progress, and detail construction techniques. The state's civil engineers not only documented building campaigns with photography, but they also orchestrated the circulation of these photographs of public works at sites for official publicity including universal expositions, publications, and the press. As a result of these and related efforts, civil engineers crafted modern Paris as a material space and as a virtual one, which drew the experience of spectators into the construction of the capital. This thesis is elucidated through five chapters that demonstrate how photography and civil engineering intersected with the urban transformation of the capital. The chapters progress chronologically and examine a series of case studies, which shift back and forth between applications of the medium in the field and the

institutional environments that structured patterns of production and reception of these photographs. By doing so, this study argues that engineers' construction of physical infrastructure was inseparable from their uses of photography, which together helped to construct the capital's modernity in the second half of the nineteenth century.

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Dedicated to Joan Mary Vandegrift

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INTRODUCTION

This study deals with the production and circulation of photographs as generative forces in the construction of modern Paris. More specifically, it turns to the photographic practices of French civil engineers that emerged in concert with the city's urbanization from 1857 to 1911. During this period, the state's engineers laid out the capital's infrastructure while systematically recording it with photography. As engineers rarely pointed the camera towards their projects, they instead relied upon the members of a fledgling profession of photographers to document the construction of public works. Nevertheless, their applications of the medium impacted the capital in novel ways. Engineers not only chronicled the construction of their building campaigns with photography, but they also probed the possibilities of the medium as a visualization technique for their field, forging epistemic equivalencies between civil engineering and photography within the walls of the École des Ponts et Chaussées--France's centralized training ground for the state's civil engineers. As graduates of the École went on to work in the municipal institutions that oversaw building campaigns in the capital, they would deploy the medium as a privileged document of engineering to survey the construction of public works with managerial efficiency.

And yet, the photographic practices of the state's engineers were never exclusively oriented to engineering practice, at least not as it has been traditionally understood. Working as state agents, they also coordinated the transmission of photographs at sites for official state culture ranging from universal expositions in Paris and abroad to the press and official publications where they flaunted the capital's industrial bravado on the photographic surface. By exploring these and related efforts, I unearth the networks crafted by engineers for the creation and dissemination of photographs. And I argue that their applications of the medium helped to

make Paris expressly modern by means of a physical transformation that was inseparable from new modes of publicity arising in concert with emerging technologies of spectatorship.

Between the time that Édouard Baldus was commissioned to photograph the construction of Hector Lefuel's and Louis Visconti's new Louvre in 1855 and the moment when the city of Paris named Charles Marville its official photographer in 1862, municipal engineers integrated photography into the routine practices involved in the construction of public works beginning in 1857.[1] At this time, photography became ubiquitous within the feverish outbreak of urban development in the Second Empire (1852-1870) overseen by Baron Georges-Éugène von Haussmann in his role as the Prefect of the Seine from 1853 to 1870 who spearheaded the city's modernization under the aegis of Napoléon III. With the sheer scale of this colossal undertaking, municipal building bureaucracies streamlined design and construction methods: the burgeoning of working drawings, building codes, and construction oversight functioned to organize the city's worksites according to the virile strictures of measurable and managerial rationality. As part of this process, municipal building administrations mobilized photographs as expeditious and

[1] The better known of these commissions include Charles Marville's work as the official photographer of the Ville de Paris and for the Service des Promenades et Plantations, Édouard Baldus's photographs for Louis Visconti's addition to the Louvre Museum, and Delmaet et Durandelle's commissions by Charles Garnier for the Paris Opéra. On Marville, see Marie de Thézy, *Charles Marville, Paris disparu* (Paris: Paris-Musées, 1994); Peter Barberie, *Conventional Pictures: Charles Marville in the Bois de Boulogne* (Ph.D. Dissertation, Princeton University, 2007). On Baldus, see Emmanuel Jacquin, "La réunion du Louvre au Tuileries," in *Louis Visconti, 1791-1853*, ed. François Hamon (Paris: DAAVP, 1992), 220-39; Barry Bergdoll, "A Matter of Time: Architects and Photographers in Second Empire France" in *The Photographs of Édouard Baldus*, ed. Malcolm Daniel (New York: Abrams, 1994), 99-119. On Delmaet et Durandelle, see Ulrich Keller, "Durandelle, the Paris Opera, and the Aesthetics of Creativity," *Gazette des Beaux-Arts* 111 (January-February 1988): 109-18; Elvire Parego, "Delmaet et Durandelle ou 'La rectitude des lignes,'" *Photographies* 5 (July 1984): 55-75; Martin Bressani and Peter Sealy, "The Opera Disseminated: Charles Garnier's Le Nouvel Opéra," in *Art and the Photographic Album*, ed. Stephen Bann (New Haven: Yale University Press, 2012), 195-219; and Christopher Mead, *Charles Garnier's Paris Opera: Architectural Empathy and the Renaissance of French Classicism* (Cambridge, MA: MIT Press, 1991). Also on Durandelle, see Claude Baillargeon, *Religious Fervor and Photographic Propoganda: Durandelle's Anatomical Studies of the Sacré-Coeur de Montmartre* (Ph.D. Dissertation, University of California, Santa Barbara, 2002); and Claude Baillargeon, "Construction Photography and the Rhetoric of Fundraising: The Maison Durandelle Sacré-Coeur Commission," *Visual Resources* 27, no. 2 (June 2011): 113-128. Neil Levine has recently published on a photograph of the Bibliothèque Sainte-Geneviève by the Bisson Frères, see Neil Levine, "The Template of Photography in Nineteenth-Century Architectural Representation," *Journal of the Society of Architectural Historians* 71, no. 3 (September 2012): 306-331.

economic documents to remotely monitor site conditions and construction progress as well as to detail the construction techniques, materials, and sculptural programs of buildings erected in the capital. Photographers, hired by state administrations or directly from architects and engineers in state service, routinely executed these photographic campaigns. With staggering frequency, photographs cropped up in the bureaus of engineers, architects, and administrators who appended precise photographic records to routine site reports and project dossiers.

Photographs commissioned by the state's engineers have been largely understood as part of the oeuvres of the individual photographers who operated the cumbersome camera equipment of early photography. These images have been principally analyzed by historians of photography who have provided insight into the genesis of Parisian urban photography by studying the photographers consumed with the labors involved in developing aesthetic and technical practices that were often remote from the mechanisms of high art.[2] These photographers frequented the city's construction sites just long enough to execute their commissions. After they left these construction sites to return to the demands of their flourishing commercial studios, their photographs would fall into the hands of engineers and bureaucrats who assigned them particular value as building documents.

In an attempt to supplement previous readings of these photographs, this study argues that the pervasiveness of photographs on the construction sites of projects in the capital in the second half of the nineteenth century contributed to official desires to publicize the city's modernization.[3] Over the course of the following dissertation, I will be concerned with the

[2] See, especially, Elizabeth Anne McCauley, *Industrial Madness: Commercial Photography in Paris, 1848-1871* (New Haven: Yale University Press, 1994); Molly Nesbit, *Atget's Seven Albums* (New Haven: Yale University Press, 1992); and Keller, "Durandelle, the Paris Opera, and the Aesthetics of Creativity," 109-18.

[3] Such a shift in disciplinary agency owes to a historiographical line of inquiry that, beginning in the 1980s, has understood photography to be a fundamental aspect of architectural practice. Architectural historians that have examined modernist architects' applications of photography in the 1920s have already sought to reframe discussions

actions and decisions of photographers only at times. More often, I will explore the significance of the photographs as they accrued meaning through their commissions and circulation in order to understand these images as documents of engineering practice and urban development. Moreover, I will argue that the widespread application of the medium in the construction process imbricated the urban transformation of the capital within the experiences of modern spectators. By looking beyond the role of photographers as the sole authors of the photographs they produced, I argue that the photographs under consideration in this study contributed to the construction of ideas of modernity, the modern city, and the modern public. These associations emerged gradually as the state's engineers first adopted the medium and, through their steady experimentation with it, ultimately propelled engineering and industrial aesthetics into popular consciousness through the circulation of images.

While engineers were hardly alone in their enthusiasm for photography's potential to document the ambitious construction campaigns of the Second Empire, they would coordinate remarkably programmatic applications of the medium. In fact, their uses of photography were often more comprehensive and systematic than those of contemporary architects who also employed photographers on the work site. The currency of photography among engineers working in the field resulted from a profession-wide interest in the medium. French civil engineering was historically anchored in centralized education; and engineers who taught and studied at the École des Ponts et Chaussées grew increasingly curious about photography's implications as a document to aid in the development of engineering science. In 1858, the École

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of modernist architecture according to questions concerning architecture's cultural implications in this later period. Certainly, we widely accept the notion that modernist architects beginning with Le Corbusier and Mies van der Rohe were conversant in the parlance of consumer culture as they integrated photography into their architectural practices. On modernist architects' use of media see, Beatriz Colomina, *Privacy and Publicity: Modern Architecture as Mass Media* (Cambridge: MIT Press, 1996); and Claire Zimmerman, "Photographic Modern Architecture: Inside 'the New Deep,'" *The Journal of Architecture* 9 (Autumn 2004): 331-354.

began to train its students in photography and subsequently established a photographic workshop. Furthermore, the school hired professional photographers to instruct engineers in the basic application of the medium. Although engineers trained at the École did not function as photographers in any official capacity in the Second Empire, this instruction was intended to prepare them to manage the photographers whom they routinely commissioned to document the construction of public works in the field.

Attending to photography's mobilization by the engineers of the Ponts et Chaussées requires taking stock of the medium's institutional role as an artifact of bureaucratic procedure, as a form of document deployed within the vast administrative apparatus of municipal building.[4] Indeed, these engineers' role as cogs in the machinery of state building was a historical condition resulting from the widespread bureaucratization of French culture and the concomitant rise of ostensibly self-regulating public administrations that replaced the monarchical institutions of the *ancien régime*. The reorganization of French civic life in the postrevolutionary period gave birth to a seemingly boundless cadre of civil servants who were trained through new channels of public education as a means to replace the nepotism that previously guided government appointments. These posts were organized according to an elaborate and hierarchical division of labor. Clerks, secretaries, managers, and directors staffed the state's burgeoning administrations that fanned out into boards, councils, committees, and subcommittees.[5]

[4] In this regard, historians of photography have also imparted important lessons about the medium, which should inform the study of photography as building media. In her study of the photographer Eugène Atget, Molly Nesbit argues for photography's role as a document laden with exchange-value. Atget, whose practice flourished at the turn of the twentieth century, navigated the nascent channels of the market economy by fashioning his photographs to meet the demands of his clients. His photographs, as Nesbit tells us, operated as commodities. Nesbit, *Atget's Seven Albums*, 80-88.

[5] A substantial amount of research has been devoted to state bureaucracies much of which takes its point of departure from Max Weber's study *Economy and Society*. Max Weber, *Economy and Society: An Outline of Interpretive Sociology*, 2 vols., trans. Guenther Roth and Claus Wittich (Berkeley: University of Berkeley Press, 1978).

By the middle of the nineteenth century, and for reasons that will be elucidated shortly, the French civil engineering profession came to operate according to this bureaucratic paradigm. State engineers would share the ideal common measure of all bureaucracies: efficiency. For these engineers in particular, efficiency was determined by the vicissitudes of their métier and entangled in a profession-wide preoccupation with the rationalization of design and construction. This preoccupation reflected their ongoing quest to tighten the relationship between the conception and realization of a given project. Rationalization, as Antoine Picon argues, was likewise a historically contingent notion. As Picon writes, rationalization was associated with "the transition from a geometric knowledge to a calculus-based [one] between 1750 and 1850, and the gradual connection between this new calculus-based engineering science with economics that occurs during the same period."[6] While such concerns did not wholly disappear after this period, in the mid-nineteenth century, a different paradigm of rationalization emerged in the wake of the concurrent bureaucratization of French culture in general. At this time, state engineers became preoccupied with matters of oversight and supervision whose efficiency was ensured through mechanisms of time management and cost planning along with the standardization of building procedures and materials.

To connect the seemingly endless channels of the bureaucratic system, state engineers, like all *fonctionnaires*, developed a particular language, which Bruno Latour has summed up with the term "paperwork."[7] Records, files, archives, balance sheets, budgets, meeting minutes, circulars, and memos formed an endless paper trail to ensure and verify the proper functioning of

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[6] Antoine Picon "Engineers and Engineering History: Problems and Perspectives," *History and Technology* 20, no. 4 (December 2004): 427.

[7] On paperwork, see Bruno Latour, "Visualization and Cognition: Thinking with Eyes and Hands," *Knowledge and Society* 6 (1986): 24-26.

the administrative apparatus. Of course, different vocations added sundry materials to their lists of documents. These engineers included many documents already familiar to them such as maps, technical drawings, site reports, cost estimates, calculations, and statistics. Other documents, such as photographs, were new. Operating in the name of efficieny, the accumulation of these weighty bundles of paper sought to democratize information, on the one hand, and created, through their sheer quantity, an inherently contradictory system, on the other.[8] In examining photography as a form of paperwork, it is thus necessary to consider the cultural desires and anxieties that accompanied the medium's ubiquity.

As photographs became prevalent in French bureaucracies in general in the second half of the nineteenth century, the state's institutions for criminology, colonialism, warfare, and the sciences all deployed the medium. Nevertheless, the application of photography in such institutions was by no means uniform. And the engineers of the Ponts et Chaussées would employ the medium according to particular conventions of their discipline. Working with photographers in the field and at the École, engineers exerted an enormous amount of energy to aesthetically fashion and technically fabricate photographs according to their established graphic conventions. In the process, they incorporated photography into a "cascade" of technical documents, which transformed photography into a model engineering document of bureaucratic practice.[9]

Taking stock of the photographic practices of the state's civil engineers within this bureaucratic climate also requires considering the political implications of their uses of the medium. Surely, the municipal building apparatus functioned under the direct control of the

[8] On the contradictory nature of paperwork, see Ben Kafka, *The Demon of Writing: The Powers and Failures of Paperwork* (Cambridge: MIT Press, 2012).

[9] Latour, "Visualization and Cognition," 16.

government.[10] As a result, this bureaucratic paradigm operated as a stabilizing agent for state desires, both in the Second Empire and in the Third Republic (1870-1940). Historically, engineers framed such questions on different terms. As the state's vast public works campaigns reflected claims on the enrichment of civic life and of the *polis*, engineers reconciled their labors in the name of the benefit of the collective and they executed their work under the banner of "*utilité publique*," or public good. [11] Yet, *utilité publique* proved to have its own politics. As Picon underscores, "the emergence of this notion is accompanied by new tensions between wellbeing in general and the necessary violence of its accomplishment, between the state responsible for this wellbeing and the individuals and groups that compose society."[12] Indeed, the state's public works campaigns frequently privileged the good of certain sectors of the public over that of others, resulting in, for example, social segregation wrought by forced expropriation.

Engineers' photographic practices also attest to the intimate and often-paradoxical relationship of social amelioration and technological determinism that is at the very heart of modernization and the creation of the modern city. While engineers consistently discussed the benefits of photography as a documentary tool to track the construction process and to enable offsite surveillance of the construction site for the sake of bureaucratic procedure, these images also proved to be astonishingly versatile forms of building documents. As soon as engineers

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[10] David Van Zanten, *Building Paris: Architectural Institutions and the Transformation of the French Capital, 1830-1870*. (Cambridge: Cambridge University Press, 1994), 46-73.

[11] For a more general discussion of the ameliorative character of public works, see Elissa Rosenberg, "Public Works and Public Space: Rethinking the Urban Park," *Journal of Architectural Education* 50, no. 2 (November 1996): 89-103.

[12] "l'émergence de cette notion s'accompagne de tensions nouvelles entre bien-être général et violence nécessaire à son accomplissement, entre l'Etat garant de ce bien-être et les individus et les groupes qui composent la société." Antoine Picon, "De l'utilité des travaux publics aux XVIIIe et XIXe siècles," in *Acteurs privés et acteurs publics. Une Histoire du partage des rôles*, ed. Jaques Theys, Monique Cavagnara and Nathalie Montel (Paris: Ministère de l'Equipement, 1994), 130.

began to engage the medium on the construction sites of Second Empire Paris, they would also disseminate these very images at sites for official state culture including the press, official publications, and universal expositions. As these images circulated, they also helped to construct Second Empire spectacle with heroic images of industrial progress, which functioned to publicize building campaigns in the name of imperial hegemony.

While the Second Empire had encouraged a flow of images in service of spectacle building, the Third Republic would also attempt to mold the experience of the modern city's construction through the circulation of engineering photography. As the young government continued the metropolis's urban development, it also sought to disassociate the capital from the fallen regime by appropriating the city as a site for the production of collective republican values and it transmitted photographs as a means to fix new conceptions of the city. To aid in this quest, engineers working at the École including Léonce Reynaud, Fernand de Dartein, and Auguste Choisy focused their attention on publicizing the state's public works campaigns on behalf of the young government between the 1870s and 1890s. Working for the goverment, these actors assumed official duties as publicists for state building campaigns before the advent of modern public relations. In this guise, they assembled photographs into an integrated, mobile, and consumable account of the capital's public works, which travelled in the state's international networks of publicity at universal expositions in Paris and abroad.

As the Second Empire and Third Republic governments found the meaning generated by these images to be remarkably malleable, they each harnessed photographs to construct a particular ideological view of the capital, which helped to make photography inextricable from the construction of the city's material infrastructure. Therefore, to speak of Paris as a quintessentially modern city is not only to discuss the metropolis's physical transformation;

rather, to do so also requires attending to the ways in which the city took form as what Henri Lefebvre once called a "virtual object," an urban vision that coalesced and circulated beyond the physical boundaries of the city itself and gained meaning though its reception.[13] Part of this effort was orchestrated through a tightly regimented and institutionalized practice in which the state's engineers guided the production and circulation of photographs of public works. Amid the remarkably heterogeneous kinds of images of the metropolis that burgeoned in the period, photographs of public works constituted a cohesive representational strategy for publicizing the capital with heroic images of industrial development. And such images of the city's public works helped to fashion Paris into a paradigmatic modern metropolis emulated in urban projects for other French cities and internationally from Buenos Aires to Chicago and Cairo.[14]

As this photographic account of the city was often substantially remote from the often-turbulent experiences of urban life, engineering photography emerged with tenacious ideological consequences, in the Marxist sense, as an abstraction of historical reality. As part of his definition of ideology, Lefebvre explains that societies do not perceive themselves "exactly as they are, but instead as projected on a screen."[15] By understanding the photograph as a surface for the projection of the values and desires of a society, rather than as a transparent record, I hope to reveal something of the experience of modern Paris as a city that imagined itself through a cascade of images. Through a sustained "sociovisual" analysis of the photographs under consideration in this study, I will argue that such images were not mere illustrations of the city's

[13] Henri Lefebvre, *The Urban Revolution* [1970], trans. Robert Bononno (Minneapolis: The University of Minnesota Press, 2003), 3. On the emergence of architecture and city planning as a virtual experience in the eighteenth century, see Richard Wittman, *Architecture, Print Culture, and the Public Sphere in Eighteenth-Century France* (London: Routledge, 2007).

[14] On the exportation of Paris as a model, see André Lortie, ed. *Paris s'exporte. Modèle d'architecture ou modèles d'architecture* (Paris: Picard, 1995).

[15] Henri Lefebvre, *The Sociology of Marx* [1966], trans. Norbert Guterman (New York: Columbia University Press, 1982), 64.

process of urbanization, but that the medium was a generative part of modernization as the metropolis became restructured into capitalist space.[16]

Since this study takes as a principal assumption that an analysis of the production of photographs will shed light on their social meaning, I will turn to technical processes of engineering science, construction, and photography at certain points in this study. It is important to stress, however, that I do not undertake technical exposition for its own sake. Rather, I am concerned with conceptualizing these aspects of the images to show the ways that, through their circulation of photographs of public works, engineers also disseminated the technical knowledge of their field to a substantially larger cultural arena in which it became a pivotal theme of modern Paris during in the Second Empire and the early decades of the Third Republic.

The chapters that follow study five episodes in which photography and civil engineering intersected within the urban transformation of the capital and present them roughly chronologically. The foci of these chapters intentionally shift back and forth between applications of the medium in the field and the institutional environments that structured patterns of production and reception of these photographs. By alternating between the on-site use of the medium and its institutional context, I hope to stress the interdependent forces that produced the meanings of the photographs.

The first chapter, "Spanning the Seine, Framing Paris," begins with the earliest experiments between engineering and photography in Paris in 1857 when the municipal administration charged with bridge building, the Service des Ponts et Chaussées, first commissioned photographer Auguste-Hippolyte Collard to document the construction and reconstruction of the bridges of Paris in the Second Empire. The chapter examines the

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[16] On "sociovisual" analysis, see Oleg Grabar, *The Great Mosque of Isfahan* (New York: Tauris, 1990), 5.

photographic representation of the bridges as part of the changing role that the structures played in urban life and the fabric of the city. In particular, it situates the bridges in a broader cultural history spanning back to the edict of 1787 to raze the houses built on these bridges as well as the suppression of their tolls in 1848. By examining the photographic practices of the Service as part of this longer history, I stress the ways in which photographic representations of these bridges helped to construct the changing functions of these structures in the life of the city. In the Second Empire, the rebuilt bridges of the historic city's center contributed to the area's transformation into modern public space. As photographs of the new bridges and their construction circulated in the horizons of Second Empire spectacle, I argue that these photographs reflected the desires of the bourgeoisie who had come to occupy the neighborhood and whose values were entangled in the creation of modern conceptions of urban public space.

The second chapter, "Engineering the Surface," leaves behind the application of photography in the field to examine the foundations of photographic instruction at the École des Ponts et Chaussées. The chapter considers courses on photography taught at the École in the Second Empire against the backdrop of dramatic institutional changes that set in motion the French civil engineering profession's bureaucratization in the middle of the nineteenth century. I consider the school's first instructor of photography, Louis-Rémy Robert, by examining both his courses at the École from 1858-72 and the photographs made by engineering students in his class as a means of integrating photography's pictorial conventions and technological orientation within engineering practice. As part of this inquiry, I situate photography among numerous other representational procedures taught to civil engineering students to suggest that engineers and photographers at the École transformed photography as a model document of engineering practice. Ultimately, this chapter sets the stage for understanding how the small-scale

mobilization of photography at the École shaped the large-scale development of modern Paris by fashioning the photograph as a visualization technique among the state's engineers.

The third chapter returns to the application of photography in the field. This chapter, "Groundwork," turns to photographs commissioned in conjunction with the diversion of potable water from the Dhuis and Vanne rivers into the capital during the Second Empire and the early years of the Third Republic. Eugène Belgrand, the director of the Service des Eaux et Égouts, oversaw the building campaigns of aqueducts bringing spring water into the city. Not only were the aqueducts funded by the city of Paris, but the city also acquired the land upon which the new structures flowed. These new water diversions thus created nationally integrated waterworks that transformed part of the French countryside into a productive resource in service of the production of the modern capital. In this chapter, I examine Collard's photographs executed as part of these building campaigns and I argue that they operated to diffuse the contentious debates that were sparked by these campaigns. Furthermore, I argue that the ideological implications of these photographs were especially prescient in light of their wide circulation. Belgrand reproduced these photographs both in the body of his publication *Les Travaux souterrains de Paris*, begun in 1875, and in an accompanying atlas, which together forged an important instrument of publicity for the city and nation. In addition, exhibitions of the Service des Eaux et Égouts at universal expositions held in Vienna in 1873 and in Paris in 1879 also circulated Collard's images in the early years of the Third Republic, and drew the city's campaigns to acquire water from distant sources into the capital's visual landscape.

The fourth chapter, "Institutions of Representation," returns to the institutional context that structured the production and circulation of photographs. It examines the ways in which engineers and photographers working at the École des Ponts et Chaussées chartered a two-part

effort to publicize photographs of public works. First, engineers including Reynaud, de Dartein, and Choisy worked within the École's drawing office to organize pavilions for universal expositions in Paris and abroad on behalf of the Ministère des Travaux Publics. As part of this effort, engineers assembled photographs into a virtual account of public works that circulated among international audiences. Second, the photographer Louis-Alphonse Davanne, who taught photography at the École des Ponts et Chaussées from 1872 to 1886 and also served as vice-president and then president of the Société Française de Photographie from 1867-1901, sought to construct an epistemic account of photography grounded in scientific models at the École as part of a broader effort to valorize the medium. In this chapter, I argue that these two concurrent activities, which radiated out from the École, operated in concert and forged an intertwined episode in the photographic practices of engineers in the 1870s and 1880s. Taken collectively, this episode helped to construct a new politics of public works that reflected ideologies of progress associated with the Third Republic's adoption of science and technology as a new language of statecraft.

The final chapter, "The Mediated City," investigates the applications of photography by municipal engineers working in the field around the turn of the twentieth century. After decades of photographic experimentation, state engineers codified multiple uses of the medium. This chapter explores the photographic strategies of municipal engineers in the period by examining four case studies involving bridge building, restoration, and maintenance. These case studies highlight the ways in which engineers increasingly exploited photography to structure the urban experience of Parisians as part of the image-saturated culture of turn-of-the-century Paris. Furthermore, this chapter looks at the ultimate fate of photography among municipal engineers: As they grew ever more familiar with the technique and as it seeped into a wider array of

engineering processes, photography's visible characteristics began to disappear as engineers integrated it into myriad applications ranging from documents for urban maintenance to the resizing of drawings. Ultimately, the very diffusion of the medium in the first decade of the twentieth century would sound the death knell for the photographic practices of the state's engineers.

In the face of the wide availability of George Eastman's handheld roll-film Kodak camera at the turn of the twentieth century, the engineers of the Ponts et Chaussées no longer associated photography with advanced technological knowledge and largely abandoned their interest in it. The opening date of this study corresponds with the moment when the engineers of the Ponts et Chaussées first adopted photography on the worksite in 1857, and the closing date of 1911 corresponds with the year when engineers ended photographic training at the École. In the early twentieth century, photography migrated into fields of cultural production associated with the nascent mass media just as the state's great propaganda campaigns that exploited photographs of public works drew to an end.

Having laid out the general parameters of this study, the rest of these introductory pages will cast municipal engineers in sharper relief by considering the ways in which their field came to function within the bureaucratic machinery of the state and to examine how this historical process underpinned their adoption of photography. As well, I will consider the ways in which the modern urban transformation of the capital was affected by the roles of these engineers in its construction in general and their application of photography in particular as they laid the state's infrastructure and concurrently propelled their building campaigns into the official conduits of state publicity.

Machines of the State

While the bureaucratic orientation of engineers emerged at mid century, their profession was marked by a systematic organization that had existed since the time of its foundations. French engineering was, of course, grounded in centralized state education. The field developed out of the legacy of Colbertism with its aspirations of tightly centralized monarchical administrations in the *ancien régime*.[17] Major French roadways historically facilitated military maneuvers and French civil engineering developed out of military engineering. The Duke of Orléans, Philippe II, founded the Corps des Ponts et Chaussées during the reign of Louis XV in 1716 according to the precedent of the officers of the Génie--the royal corps of military engineers--and entrusted them with the planning and maintenance of French roads. Departing from their militaristic pedigree, the responsibilities of the Corps quickly expanded to encompass other aspects of the country's transportation system including public works, earthworks, and waterways.[18]

These engineers witnessed the tighter systemization of their profession after the dramatic restructuring of the French institutional landscape in the revolutionary period. At this time, the École was recast as part of broader efforts to establish a new system of democratized state

[17] These engineers have a difficult historiographic relationship to Second Empire Paris. While subsequent histories of Second Empire Paris deal with them, they are typically divorced from their longer professional history. By contrast, scholars writing on the history of these engineers skirt around their contribution to Second Empire urbanism as a means to distance them from negative political associations with the imperial regime.

[18] On the history of the École des Ponts et Chaussées, see André Brunot and Roger Coquand, *Le Corps des ponts et chaussées* (Paris: Éditions du Centre national de la recherche scientifique, 1982); Fernand de Dartein, *La Vie et les travaux de Jean-Rondolphe Perronet* (Paris: Imprimerie E. Bernard, 1907); Bertrand Lemoine, *Construire, equipper, aménager. La France des ponts et chaussées* (Paris: Gallimard, 2005); Antoine Picon, *L'Invention de l'ingénieur moderne. L'École des Ponts et Chaussées, 1747-1851* (Paris: Presses de l'École nationale des ponts et chaussées, 1992); and Antoine Picon, *French Architects and Engineers in the Age of the Enlightenment*, trans. Martin Thom (Cambridge: Cambridge University Press, 1992).

education for technical learning. [19] In turn, this new system gave rise to a tightly centralized, hierarchical, and rigorously institutionalized technical corps. Graduation from the École Polytechnique subsequently became mandatory to access this elite technocratic culture. Founded in 1794, the École Polytechnique provided a general technical training based in the teaching of mathematics and the pure sciences with an emphasis, by the 1820s, on physics. Only after obtaining a diploma from this institution could students gain entry into one of France's *grandes écoles* for technical training such as the École des Ponts et Chaussées. This broad technical reorientation of French education also remodeled instruction at the École des Ponts et Chaussées. In the first half of the nineteenth century, the École produced engineer-*savants* who applied this new emphasis in mathematics and the pure sciences to civil engineering. These particular circumstances made these engineers synonymous with an approach to civil engineering associated with their particular interest in mathematical rationalization.

But a pedagogical model based in mathematics and pure sciences confronted the engineers trained at the École des Ponts et Chaussées with other challenges. The prominence assigned to this model of technical learning by the École and French education in general developed out of liberal social philosophy of the Enlightenment and the French Revolution. As part of the transformation of institutions of the *ancien régime* into modern bureaucratic administrations, technical learning provided a new democratized platform for universally accessible education. Public technical education was to replace the oral traditions of knowledge

[19] On French technical education in general, see Bruno Belhoste, *La formation d'une technocratie. L'École polytechnique et ses élèves de la Révolution au Second Empire* (Paris: Belin, 2003); Bruno Belhoste and Konstantinos Chatzis, "From Technical Corps to Technocratic Power: French State Engineers and their Professional and Cultural Universe in the First Half of the 19th Century," *History and Technology* 23, no. 3 (September 2007): 209-225; Terry Shinn, *Savoir scientifique et pouvoir social. L'Ecole polytéchnique, 1794-1914* (Paris: Presses de la Fondation Nationale des Sciences Politiques, 1980); and John H. Weiss, *The Making of Technological Man: The Social Origins of French Engineering Education* (Cambridge: MIT Press, 1982).

and technique formerly passed down from master to apprentice within the guild system.[20] While the aspirations of France's emerging technical corps were founded upon these socially progressive ambitions, they posed particular problems for the engineers of the Ponts et Chaussées. Although these engineers made substantial contributions to theoretical problems--especially those of mechanics--in the first half of the nineteenth century, their profession increasingly appeared at odds with the practical demands placed on civil engineers working in the field.

As an elite corps of technical experts, the engineers of the Ponts et Chaussées enjoyed notable institutional autonomy in nineteenth-century France and their field thus carried substantial cultural capital. Their visible role in French society made these engineers especially prone to public scrutiny. Throughout the nineteenth century, the engineers of the Ponts et Chaussées regularly came under attack for their association with the *ancien régime*.[21] This more generalized critique gained force in the first half of the nineteenth century when critics reproached engineers' emphasis on a theoretical, rather than practical, approach to their profession.

These critiques carried such cultural currency in public debates in nineteenth-century France that Honoré de Balzac addressed them at length in his novel *The Village Rector* of 1841. In a letter penned by Balzac's character Grégoire Gérard, a recent graduate of the École des Ponts et Chaussées, the engineer disparaged the flawed state of French technical education

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[20] Allan Potofsky, "The Construction of Paris and the Crises of the Ancien Régime: The Police and the People of the Parisian Building Sites, 1750-1789," *French Historical Studies* 27, no. 1 (Winter 2004): 9-48. On the rise of universal public education in France, see David Bell, *The Cult of the Nation in France: Inventing Nationalism, 1680-1800* (Cambridge, MA: Harvard University Press, 2001), 162-163.

[21] Jurist Léon Aucoc outlined these critiques in his course on administrative law that he taught at the École beginning in the Second Empire. Léon Aucoc, *Conférences sur l'administration et le droit administratif* (Paris: Dudon, 1869), 620-623.

during the Bourbon Restoration (1814-1830).[22] While having excelled in mathematics at the École, Gérard was subsequently employed by the state and languished in a government post charged with road maintenance in Limoges where he was left to "count and measure pavements and heaps of stones on the roadways."[23]

Through Gérard, Balzac lauded the emphasis on the applied sciences in England, Germany, and the United States where the needs of industry guided engineering practice. And he decried the growing bureaucracy of the engineers of the Ponts et Chaussées monopolized by the desires of the state. Specifically, Gérard observed that within the hierarchical context of the Ponts et Chaussées "the reward of merit" gained by these engineers through the prestige of their pedigree "devolves into incapacity."[24] Gérard recalled the "disaster which happened in the heart of Paris to the first suspension bridge built by an engineer." Balzac was referring to the notorious near collapse of the Pont des Invalides while still under construction in 1827. The acclaimed engineer Louis Navier had failed to consider the friction of the cables on the anchorage of the bridge.[25] As a result, water began to erode the foundations of the bridge's towers, placing them in danger of collapse. Although it was technically possible to rectify the situation, the project was abandoned before its completion to suppress further public outrage and the bridge was subsequently resuscitated in 1829 at a new site.

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[22] Honoré de Balzac, *The Village Rector* [1841], trans. Katherine Prescott Wormeley (Whitefish: Kessinger Publishing, 2004), 150-161.

[23] Balzac, *The Village Rector*, 151.

[24] Balzac, *The Village Rector*, 155.

[25] On the collapse of the Pont des Invalides, see Eda Kranakis, *Constructing a Bridge: An Exploration of Engineering Culture, Design, and Research in Nineteenth-Century France and America* (Cambridge: MIT Press, 1997), 166-195; and Antoine Picon, "Navier and the Introduction of Suspension Bridges in France," *Construction History* 4 (1988): 21-34.

For Balzac, the example of the bridge pointed to the inefficiency and incompetence of these engineers who prioritized an experimental approach to design based in mathematics over verified method. Balzac's character, moreover, conflated the bureaucratization of engineering at the École with its pedagogical emphasis on pure science and mathematics, which he argued diluted the art of building: "Trained from their earliest years to the baldness of axiom and formula, the youths who leave the École have lost the sense of elegance and ornament; a column seems to them useless; they return to the point where art begins, and cling to the useful."[26] Balzac's amalgam of bureaucratic abstraction, mathematic standardization, and artistic dilution, established the terms of lasting critiques against the engineers of the Ponts et Chaussées.[27]

Beginning in the July Monarchy, however, these engineers would direct their attention to the practical matters of applied engineering science and they began to assume an increasingly complex institutional role marked by the escalating pressures of industrialization and urbanization. In particular, these engineers came to function as official interlocutors between the overlapping public and private interests invested in the development of France's built environment. Gradually, many state engineers left their posts to work for railroad companies and in private industry in France and abroad. This shift became pronounced in 1842 when the July Monarchy passed its long-debated law for the creation of a national rail system that linked Paris to the country's borders. As a result, the government began to grant these engineers leaves of

[26] Balzac, *The Village Rector*, 155.

[27] Such critiques were subsequently rehearsed by such dissimilar figures as critic Pierre-Joseph Proudhon and architect Charles Garnier. Pierre-Joseph Proudhon, *Du principe de l'art et de sa destination sociale* (Paris: A. Lacroix, 1865), 170; and Charles Garnier, "Art et progrès," *Construction moderne* 3 (29 October 1887): 26. Proudhon's critique is taken up in chapter 2. The terms of this generalized critique would also help to abstract the engineer in the cultural imagination, and would also permeate the historiography of modernist architecture, a subject discussed in the conclusion of this dissertation.

absence to lend their expertise to railroad companies.[28] In addition to their work in private industry, these engineers were also plunged into the industrialized building booms of the July Monarchy and the Second Empire. The strong emphasis they had placed on theoretical approaches to design earlier in the century was jettisoned in response to the realities of building within fast-paced construction cycles.

The École des Ponts et Chaussées would also have to respond to the growing need for practical training among its students. In August 1851, then Ministre des Travaux Publics Pierre Magne handed down a series of decrees to the École that set a disciplinary seachange in motion. These decrees dramatically restructured civil engineering training to attend to the role of private industry in the construction of national territory. The most powerful of these decrees stated that classes at the École were to be opened to candidates not trained at the École Polytechnique. As a result, foreigners and auditors from outside the school were also allowed to follow coursework at the École.[29] These reforms, which replaced the merit-based system of candidate selection, now permitted a broader variety of students to follow the École's coursework and filled the pressing need for a larger cadre of civil engineers by the state and private industry.

Within the circumscribed universe of the French civil engineering profession, these reforms significantly fractured the autonomy traditionally retained by these engineers since the founding of the École and constituted a turning point for their discipline. Indeed, beginning in the July Monarchy, government institutions for building witnessed an unprecedented level of state centralization. As David van Zanten writes, "Never before or since in France during the years of

[28] Arthur Dunham, "How the First French Railways were Planned," *The Journal of Economic History* 1, no. 1 (May 1941): 12-25; Louis Girard, *La Politique des Travaux Publics du Second Empire* (Paris: Armand Colin, 1951), 4.

[29] See the nine-page account of these decrees: *Procès-verbaux des séances du conseil*, August 1851, reg. 2, ENPC, 397-405. See also Brunot and Coquand, *Les Corps des ponts et chaussées*, 241-242. Antoine Picon's seminal study of the École covers the period from 1747-1851, notably concluding with these reforms. Picon, *L'Invention de l'ingénieur modern*, 457-467.

1830-1870 was government control of architecture and urbanism so pervasive and powerful."[30] In this atmosphere, the reforms at the École des Ponts et Chaussées were hardly unique; similar reforms had also been made at the École Polytechnique. Nevertheless, the executive council of the École des Ponts et Chaussées raised objection to the reforms and hotly debated their ramifications.[31] The director of the school's council, Louis-Auguste Cavalier, noted that "it is perhaps regrettable that the ministerial decision had been made without the council of the school having been consulted." Nevertheless, he was obligated to execute the command of the higher administration. Closing the book on the matter, Cavalier declared to the school's administrators: "it does not suit the council to open a discussion that can only end without result."[32] The council subsequently implemented the reforms of the ministry over the next year. As one instructor at the École aptly proclaimed, the "school will be profoundly modified or, rather, entirely changed."[33]

As part of this institutional restructuring, the École subsequently implemented new coursework beginning in the 1850s. In addition to the rigorous study of mathematics, physics, construction, mechanics, hydraulics, and architecture, the school put into practice a remarkably diverse range of yearly workshops to train students in industrial processes and technical methods dealing with such subjects as pisciculture, the electric telegraph, ventilation, tramways, and

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[30] Van Zanten, *Building Paris: Architectural Institutions and the Transformation of the French Capital, 1830-1870*, 46. Van Zanten also traces parallel reforms in the state's architecture bureaucracies, 46-73.

[31] On the reforms at the École Polytechnique, see Belhoste, *La formation d'une technocratie. L'École polytechnique et ses élèves de la Révolution au Second Empire*, 228.

[32] "…il est peut-être regrettable que la décision ministérielle ait été prise sans que le Conseil de l'école ait été consulté ; mais que désormais le Conseil n'a plus qu'une mission à remplir, celle de proposer les dispositions propres à assurer l'exécution de cette mesure. Il ne pense pas qu'il convienne au Conseil de se livrer à une discussion qui ne pourrais être que sans résultat." *Procès-verbaux des séances du conseil*, August 1851, ENPC, reg. 2, 298.

[33] "…cette école sera profondément modifiée ou plutôt entièrement changée." *Procès-verbaux des séances du conseil*, November 1851, ENPC, reg. 2, 431.

photography. Such courses provided engineers with sufficient knowledge about these subjects to enable them to oversee the increasingly diversified projects that they would manage in the field.

In the face of this disciplinary transformation, these engineers came to work within a managerial professional paradigm and began to redirect technologies and instruments in service of new projects in the French capital. There, they conceptualized the discrete public work as part of a larger urban system of social, financial, and territorial organization. Urban circulation--the movement of people and commodities as much as of water, air, waste, and, by the end of the century, electricity across bridges, along railroad tracts, and through pipelines--was central to their mission. Only by interweaving a series of seemingly fragmented practices into a new model of pedagogy could the school train students to contribute to the capital's rapid modernization.

Urban Change

In the years of the July Monarchy, the capital had witnessed a dramatic and unprecedented population surge, which fed the city's booming market economy.[34] The government had created a nationally integrated canal system and was in the midst of doing the same with the railroad. The metropolis was the central hub of a national, and increasingly global, transportation network circulating cotton and coal from colonial markets into the capital.[35] Although the city had become embedded in capital, it was physically unprepared to support the concentration of people inundating the metropolis. With the city's booming population arose

[34] The population of Paris had grown from 785,866 in 1831 to 1,053,897 in 1846. After the communes were annexed into the capital in 1860, the population reached 1,696,141 in 1861, see Louis Chevalier, *La Formation de la population parisienne au XIXe siècle* (Paris: Presses Universitaires, 1950), 54.

[35] Louis Girard, *La Politique des travaux publics du Second Empire*, 11.

new concerns over urban sanitation and safety. In response to the cholera epidemics that swept through the city in 1832 and 1848, hygienists pointed to the city's overcrowded and tightly knit medieval urban tissue with its cramped streets running with raw sewage as miasmic bastions of disease.[36] While notions concerning the amelioration of urban life through calculated changes to the urban fabric arose--and, in many cases, were carefully planned--in the July Monarchy, the economic crisis and the revolution of 1848 quelled the government's aspirations. It would be left to the government of the Second Empire to transform the largely medieval city into a paradigmatic modern metropolis. It is my purpose of this section to review some of these more familiar facets of the history of the city's modernization, which shot through the work of municipal engineers in the metropolis and which eventually intersected with their photographic practices.[37] As engineers laid the capital's physical infrastructure, they concurrently systematized the circulation of images to publicize their building campaigns, an effort which must be understood in the context of the broader culture of Second Empire urban planning.

In the most dramatic restructuring of municipal institutions for state building since the revolutionary period and in the name of imperial progress, Napoleon III and the Prefect of the Seine, Haussmann, shepherded an aggressive campaign of urban development by razing the city's medieval core, broadening and lengthening streets and boulevards, regulating building heights and facades, creating new parks such as the Bois de Boulogne and the Bois de

[36] René Le Mée, "Le cholera et la question des logements insalubres à Paris (1832-1849)," *Population* 53, no. 1-2 (January-April 1998): 379-397. I take up this issue in greater detail as related to the rebuilding of the bridges of the city center in the next chapter. A secondary, if sometimes exaggerated, concern related to the city's defenses. Louis-Napoléon Bonaparte had risen to power on the heels of the bloody June days of 1848. With the threat of uprisings always looming, the city's dense urban enclaves thus also presented potential pockets of civic unrest.

[37] The literature on Second Empire urbanism is vast. See, principally, Jean de Cars, *Haussmann, la gloire du Second Empire* (Paris: Librairie academique Perrin, 1978); Jean de Cars and Pierre Pinon, eds. *Paris-Haussmann*. (Paris: Picard, 1991); David Jordan, *Transforming Paris: The Life and Labors of Baron Haussmann* (New York: The Free Press, 1995); André Morizet, *Du vieux Paris au Paris moderne* (Paris: Hachette, 1932); David Pinkney, *Napoleon III and the Rebuilding of Paris*. (Princeton: Princeton University Press, 1958); and Van Zanten, *Building Paris: Architectural Institutions and the Transformation of the French Capital, 1830-1870*.

Vincennes, and furnishing new provisions for water and waste disposal. New monuments were planned, while existing ones were disencumbered of structures encroaching upon them. These efforts were braided together by an expansive network of bridges, aqueducts, and roads that sustained urban life by supporting unprecedented flows of people and commodities circulating throughout the city.

The rapidly changing realities of urban life triggered new ways of discussing the city and its urban development.[38] Paris's urban discourse was historically understood according to the conventions of *embellissement*. Proposed by Enlightenment urban reformers, the terms of *embellissement* were circumscribed by concerns of style, monumentality, and hygiene.[39] Although these categories certainly endured throughout the nineteenth century, conversations over the city's urban development expanded beyond the conceptual framework of *embellissement* with its focus on localized monuments.

Increasingly, urban discourse was galvanized around the term *réseau*, or network, which referred to the organization of the city into an urban system. The word's transposition into the descriptions of larger systems of social, industrial, and spatial communication, as historians such as Pierre Musso, Nicholas Papayanis, and Antoine Picon have argued, developed within Saint-Simonian thought of the 1830s.[40] It was in the context of utopian Saint-Simonian proposals for

[38] These changes were bound up in the historical emergence the very notion of urbanization. Ildefonso Cerdà of course coined the term urbanization in 1867 to conceptualize his planning for Barcelona's Eixample, a plan based on what he observed during his visits to Second Empire Paris. The process of urbanism surely predates the invention of the term developed to express an already extant process; the coinage of the term merely underscores the remarkably self-conscious awareness of that process. Ildefonso Cerdà, *Teoría General de la Urbanización* (Madrid: Torija, 1867).

[39] As Richard Etlin notes, *embellissement* "must be understood to include cultural aspirations and functional amenities as well as aesthetic pleasures." Richard Etlin, *Symbolic Space: French Enlightenment Architecture and its Legacy* (Chicago: University of Chicago Press, 1994), 2-3.

[40] Pierre Musso, *Télécommunications et philosophie des réseaux. La Postérité paradoxale de Saint-Simon* (Paris: Presses universitaires de France, 1997); Nicholas Papayanis, *Planning Paris before Haussmann* (Baltimore: The Johns Hopkins University Press, 2004); and Antoine Picon, *Les Saint-simoniens. Raison, imaginaire et utopie*

urban amelioration, which multiplied during the July Monarchy, that the term *réseau* came to occupy a privileged position within the discourse of city planning. Subsequently, Haussmann himself claimed to have developed the city by means of three programmatic *réseaux* according to which the city's work sequentially progressed. Yet, these networks were never formalized to the synthetic degree suggested by the term. In fact, the city's networks were pliant and constantly unfolded according to the vicissitudes of a series of smaller projects.[41]

Discussions of the city as a network conjure notions of urban mobility and circulation along with the organization, if not naturalization, of flows of bodies and commodities within the capital. In this regard, the city's *réseaux* elicit a totalizing effort to equalize people moving freely along the lithe contours of an urban system. For all of the term's progressive associations, the city's internal systematization was rife with contradictions that remain at the core of the very concept of the modern city.

New urban thoroughfares including broad boulevards and new bridges indeed opened the city to substantially greater circulation. The government, however, was unable to undertake much of this work without coercive social measures, including the implementation of expropriation by decree. Although Louis-Napoléon had been elected president by universal suffrage, his subsequent *coup d'état* of 1851 brought him to the throne in 1852. The Second Empire government subsequently reenacted the July Monarchy's ordinance of 1835 that

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(Paris: Belin, 2002). See also Richard Wittman, "Space, Networks, and the Saint-Simonians," *Grey Room* 40 (Summer 2010): 24-49. Of course, the term was also central to many French engineers who had themselves appropriated the philosophy of Saint-Simonianism in the 1830s.

[41] Christopher Mead, "Urban Contingency and the Problem of Representation in Second Empire Paris," *Journal of the Society of Architectural Historians* 54 (June 1995): 138-174; and Pierre Pinon, "Une nouvelle géometrie pour la ville," in *Paris-Haussmann*, 81-85.

permitted expropriation under the banner of *utilité publique* by an imperial decree of 1852.[42] By means of this decree, the government cleared the city's center of its old medieval infill and dislocated spatial concentrations of the working class from the area. By transforming the city's center into dazzling spaces for the bourgeoisie, the state polarized the city socially by means of class-based segregation.

As the city witnessed its historic transformation into modern urban space-- pulsating with flows of people, commodities, and capital--new social relationships emerged that were also pregnant with the same kind of contradictions between the progressive and repressive aspects of modernization. François Loyer has articulated these changes in terms of a paradigmatic shift in "space-time" relations, which was triggered by transportation technologies and which created new ties between the people of once isolated communities by encouraging new forms of movement and interaction. The city's very ability to expand its geographic borders in the nineteenth century--including the annexation of the eleven surrounding *faubourgs* into the capital in 1860, which is the pivotal example--was made possible by new modes of transportation, such as omnibuses, that then brought the working class from peripheral neighborhoods into the city center for work.[43] While these changes dated back to the July Monarchy, they grew increasingly palpable in the life of the metropolis over the course of the second half of the nineteenth century. These spatio-temporal changes became a defining aspect of modern urban space and constituted one of the city's fundamental departures from earlier forms of urban life.

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[42] Léon Aucoc, *Conférences sur L'administration et le droit administratif*, 632; and Henri de Pontich, *Administration de la ville de Paris et du département de la Seine* (Paris: Guilaumin, 1884), 256-264.

[43] François Loyer, *Paris Nineteenth Century: Architecture and Urbanism*, trans. Charles Lynn Clark (New York: Abbeville Press Publishers, 1988), 107.

Questions concerning urban circulation are today well-understood components of modern Paris. And their inscription into the urban fabric was largely the result of the engineers of the Ponts et Chaussées. For their work in the capital, they harnessed together social, economic, and territorial practices to help shape the modern city, support its inhabitants, and sustain urban life. The privileged place occupied by the state in the city's governance reflects another aspect of the particular culture of French urban discourse. In the context of nineteenth-century France, public space was discussed on the terms of the *voirie publique* (or public thoroughfares), which denoted a physical place, on the one hand, and the administrative stewardship of that place, on the other.[44] It is therefore hardly surprising that the capital's pivotal physical rescaling was accompanied by a bureaucratic overhaul of municipal services for building. As the organization of the city's expanded services was a primary concern for the government, Haussmann distributed these engineers among a range of institutions including the Service de la Navigation de la Seine, the Service des Eaux et Égouts, the the Service Technique de la Voie Publique, and the Service des Promenades et Plantations.

While Haussmann operated as the titular head of these operations, his unflagging association with the modernization of Paris raises fewer questions about the achievements of a single individual than about the larger process of Haussmannization with which his name became associated in his own day.[45] While Haussmann will inevitably appear in the pages that follow, this study looks back at the city's transformation to move beyond received histories that assign a privileged position to the prefect and the will of a single individual. Instead, I adopt a historical model based upon multiple authorship to consider the particular roles played by the

[44] Jean-Pierre Frey, "Généalogie du mot 'urbanisme'" *Urbanisme* 304 (January-February 1999): 53-71.

[45] David Jordan, "Haussmann and Haussmannisation: The Legacy for Paris," *French Historical Studies* 27, no. 1 (Winter 2004): 87-113.

engineers of the Ponts et Chaussées. After all, the increasing bureaucratization of the city's municipal institutions for building crystalized an institutional system for urban development and maintenance that lasted long after Haussmann's tenure in office.

The Photographic City

The adoption of photography by engineers, with its remarkable ability to render visible that which otherwise might remain out of sight, occupied a central position in the transposition of their ostensibly invisible work into a theme of the modern metropolis. To conclude these introductory pages, I want to tie together the ideas raised thus far by considering the particular role of photography as it was developed by the engineers of the Ponts et Chaussées for their work in the capital. As much as they were consumed with the effort to lay the infrastructure that transformed the capital into a circulatory leviathan, which absorbed the protean and contested experiences of modern urban life, their adoption of photography would create new points of contact between the city and a growing public. As the state's engineers reproduced and circulated photographs of public works in official publications, in the press, and at universal expositions, the city's exuberant transformation congealed in the eyes of geographically dispersed spectators and integrated modern publicity into a fundamental component of the modern city.

At their core, these photographs tied together the explicit ameliorative associations of public works with urban representation. Frequently representing the course of the construction process by means of successive images that ended in the triumphal completion of a new project, photographs commissioned by municipal engineers visualized the city's technological

accomplishment and formalized urban development into a temporal model of linear progress. In service of the state, these engineers narrated the metropolis through the Second Empire and Third Republic's official mythology of the modern city as an evolutionary process. Rendering the capital according to modernity's aspirations of a monolithic and integrated urban reality, these photographs thus helped to construct the official mythology of the modern city in visual terms.[46]

Images of power convey fairly durable forms of meaning and thus ceaselessly captivate governments in their ongoing quest to demonstrate authority. The mythology of the modern city that these photographs advanced remained remarkably stable within the successive governments of the Second Empire and the Third Republic. Much of the literature on nineteenth-century Paris, however, emphasizes the city's transformation during the Second Empire. By doing so, scholars have often assumed that material changes permanently scarred the city. Such a reading has forever circumscribed the city within a kind of discursive stranglehold that belies the fact that cities are the products of a continual process of development. Without seeking to diffuse the upheavals and coercive tactics associated with the Second Empire's planning policies, it is nevertheless important to underscore the differences and continuities of urban change that extended from the Second Empire into the Third Republic.

The city's modern transformation fed into a colossal quest that, stretching back to the *ancien régime*, sought to consolidate the metropolis into a representation of the nation in visual terms. Indeed, revisions of the city's urban form had long been an index of this broader political

[46] On the official mythology of modern Paris, see T. J. Clark, *The Painting of Modern Life: Paris in the Art of Manet and his Followers* (Princeton: Princeton University Press, 1985); and David Harvey, *Paris, Capital of Modernity* (New York: Routledge, 2003). Jeannene Przyblyski has importantly underscored that not all contemporaneous photographs of Paris necessarily feed this mythology. Jeannene Przyblyski, "Images de la modernité avant Haussmann," in *La Modernité avant Haussmann. Formes de l'espace urbain à Paris, 1801-1853*, ed. Karen Bowie (Paris: Éditions de la Recherche, 2001), 58-59.

campaign. And the changing imperial, monarchical, and republican governments of nineteenth-century France each stamped the city with its attendant ideological ambitions through revisions to the urban fabric.

However, as the Second Empire and Third Republic governments sequentially took on the task of molding the capital into a representation of the centralized state, they harnessed forces that significantly differed from those of previous regimes. With the escalation of the competing forces that marked the rise of the modern bureaucratic state, the city was no longer the immutable expression of a government that was formalized in the sovereign. Gradually, the state coalesced around the bourgeoisie whose status was defined by professional affiliations and education rather than by inherited position. Even in the face of the imperial rule of the Second Empire, changes to the urban fabric could no longer be said to be solely the reflection of the emperor or, for that matter, his prefect. Instead, the meaning transmitted by urban representation became increasingly volatile in relation to the more stable signification that it once bore. Thus, as the new boulevards swept the urban elite into dramatic scenery flanked by apartment buildings and commerce, the city faced, as Christopher Mead explains, "a crisis in representation that inevitably and necessarily had its effects on the state's institutions and its monuments."[47]

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[47] Mead, "Urban Contingency and the Problem of Representation in Second Empire Paris," 141. Mead's discussion is grounded in a reading of Jürgen Habermas's concept of the public sphere. In Habermas's discussion of the nineteenth-century disintegration of the bourgeois public sphere, he explains that "When the laws of the market governing the sphere of commodity exchange and of social labor also pervaded the sphere reserved for private people as a public, rational-critical debates had a tendency to be replaced by consumption, and the web of public communication unraveled into acts of individual reception, however uniform in mode." See Jürgen Habermas, *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society,* trans. Thomas Burger (Cambridge: MIT Press, 1991), 161. Historians of eighteenth-century French architecture have taken up Habermas's thesis and correlate the architectural theory of the period with the flourishing of the public sphere. See Sylvia Lavin, "Re-Reading the Encyclopedia: Architectural Theory and the Formation of the Public in Late-Eighteenth-Century France," *The Journal of the Society of Architectural Historians* 53, no. 2 (June 1994): 184-192; and Wittman, *Architecture, Print Culture, and the Public Sphere in Eighteenth-Century France*. Wittman's discussion has been especially important to my treatment of this subject.

The problematic status of urban representation has been a fundamental concern for scholars of nineteenth-century Paris. They have probed an extensive range of media for the ideological imprint of the social, political, and economic changes of the Second Empire and Third Republic.[48] This study seeks to add to this body of literature by suggesting that to attend to questions of the urban representation of nineteenth-century Paris requires addressing the shift in the city's material dynamics that emerged in concert with the very forces of industrialization and capitalist production that propelled this "crisis" from the outset. In writing the history of the modernization of Paris, it is crucial to take stock of photography, along with its qualities of representation and reproduction, as a constituent material of the construction of the modern metropolis, which is as important as its stone and mortar. An important part of the story of modern Paris involves the ways in which the circulation of images created new points of contact among Parisians, the public, and the city itself. The present work endeavors to investigate the historical implications of visually mediated building practices for the construction of the modern capital in particular and modern urban experience in general. As the state's civil engineers laid Paris's physical infrastructure, they simultaneously erected a visual network in which they mobilized photography as a means to order the ways that the city and its infrastructure were understood. And, in the process, they made modernity more visible by constructing the capital's industrial imagination. It will be a principal contention of this study that this doubling effect, which created a material and virtual city, constituted a fundamental aspect of the city's modernity in the second half of the nineteenth century.

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[48] There is an extensive and well-known body of scholarship that attends to urban representations of nineteenth-century Paris. See, principally, Clark, *The Painting of Modern Life: Paris and the Art of Manet and his Followers*; Pricilla Ferguson, *Paris as Revolution: Writing the Nineteenth-Century City* (Berkeley: University of California Press, 1994); Shelly Rice, *Parisian Views* (Cambridge, MA: The MIT Press, 1997); Katherine Fischer Taylor, *In the Theater of Criminal Justice: The Palais de Justice in Second Empire Paris* (Princeton: Princeton University Press, 1993): and David Van Zanten, *Building Paris: Architectural Institutions and the Transformation of the French Capital, 1830-1870*.

CHAPTER 1. SPANNING THE SEINE, FRAMING PARIS

While gazing over Paris from atop the tower of the church of Saint-Gervais-et-Saint-Protais in 1860, Achille Léon Quinet photographed a sweeping panoramic view of the city's historic center below (Fig. 1.1). The photograph is saturated in urban fabric, which is splayed across either side of the river Seine on the Île de la Cité and the Right Bank. To the far right, the camera lens glimpses the back of the arcuated pediment surmounted by the cross atop the church in which Quinet stands. In front of the church's façade rise the mansards of the old Hôtel de Ville that the Communards would send up in flames scarcely eleven years later. To the far left, the Sainte-Chapelle emerges out of the complex of the Palais de Justice beneath. Traversing the city and the photograph, the Seine cuts through the composition diagonally as its bending contours dissipate into the western vanishing point. Strewn with its bridges and quays, the city's fluvial artery comes the closest to providing the photograph with a primary subject. The superimposition of monuments and urban infill nevertheless generates a blurring effect within the image, drawing the river into the particular perceptual conflict of *horror vacui* posed by the photograph as the city's densely grouped urban elements congeal into an all-encompassing image.

Quinet opened his commercial album of photographs, *Vues de Paris* of 1860, with this bird's-eye view of the city center and he then descended to the streets below where he zoomed in on individual monuments to compile the album's visual narrative. Following pictorial conventions long rehearsed in popular publications illustrating the capital, such as urban physiognomies and guidebooks, bird's-eye views of the city's center enjoyed broad popular appeal and subsequently constituted a ubiquitous subject of Paris's urban iconography in the

nineteenth century.[1] Built upon the Roman ruins of Lutecia, the Île de la Cité along with the Hôtel de Ville flanking the island on the Right Bank once comprised the ecclesiastic, administrative, and monarchical seat of the crown and thus the historic and symbolic cradle of the capital and nation. Before the advent of photography, the makers of topographic views typically depended upon maps from which they projected the city's built form into oblique perspectives. These draftsmen crafted such illustrations into visual ideations of the crown by adopting the lofty vantage point of the sovereign who surveys his domain while gazing downward from a nearly impossible height above the city.[2] Only then did artisans work up the details of individual monuments to refine the image's visual coherence and render an idealized view of the city.

Quinet's photographic composition is strikingly similar to graphic representation--only chemistry and physics have replaced the metrics of topographic drawing. The albumen process permitted Quinet to render a comparable view by fixing a stable image of the city in a chemical emulsion and thus circumvent his predecessors' laborious graphic translations. Yet, Quinet's photograph was bereft of the refinements of tone and contour afforded by hard line drawing. Photography's "reality effects" thus posed an intractable, if obvious enough, problem for urban representation.[3] Without the draftsman's ability to amplify or suppress certain aspects of the

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[1] Bird's-eye views of the city also provided a literary trope as canonically illustrated in the introduction of Victor Hugo's *Notre-Dame de Paris*. See Victor Hugo, *Notre-Dame de Paris* [1831] (Paris: Eugène Renduel, 1836). See also the chapter "The View from Notre-Dame," in Clark, *The Painting of Modern Life: Paris and the Art of Manet and his Followers*, 23-78. On the historical development of bird's-eye views in cartography and their gradual replacement by planimetric views based on orthogonal planning, see Min Kyung Lee, "An Objective Point of View: The Orthogonal Grid in Eighteenth-Century Plans of Paris," *The Journal of Architecture* 17, no. 1 (February 2012): 11-34.

[2] See the discussion of perspective in Yves-Alain Bois, "Metamorphosis of Axonometry," *Daidalos* 1 (1981): 41-58. On the relationship between the angle of bird's-eye view maps and the crown's claim to the domain, see Louis Marin, *De le répresentation* (Paris: Gallimard Le Seuil, 1994), 212-213.

[3] Tom Gunning, "An Aesthetic of Astonishment: Early Film and the (In)Credulous Spectator," in *Viewing Positions: Ways of Seeing Film,* ed. Linda Williams (Rutgers: Rutgers University Press, 1994), 114-133.

city's appearance, Quinet had remarkably little control over the ways in which the metropolis materialized on the photographic surface.[4] Instead, Quinet's photograph reproduced much larger, indeed formative, changes to the city's urban fabric.

While the neighborhood had once gained representational legibility through the corrections made by draftsmen with ink on paper, the Second Empire government had adopted the weightier instruments of demolition and construction to reconfigure the silhouette of the city's core. The government had usurped the historic neighborhood and transformed it into a veritable museum *en plein air* comprised of monuments that served as the state's administrative seat. And the municipal government largely completed its ambitious reclamation of the city's center by 1860. As part of this process, the government had also transformed the neighborhood into a *point de vue*, a perspective that molded the area into representational and compositional coherence. It is no coincidence that such bird's-eye views of the city's center dominated popular images of the metropolis in the nineteenth century as the neighborhood gained new topographic legibility. In fact, the physical transformation of the city had formalized the surfaces of the metropolis into a consumable image: a commodity. The government had molded the city center into an urban stage to be circulated and traversed by the bourgeoisie. As part of this process, the state also propelled the metropolis into the flow of images consumed by this affluent class that arose as part of the city's market economy and its concomitant networks of publicity and consumer culture.

Photographs not only contributed to the city's burgeoning visual landscape, but they also played a generative role in the construction of the capital as French building professions would

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[4] Photographers would, however, soon have greater control over the image's content by means of manipulating and superimposing negatives. Baldus, for example, would retouch his negatives. See Malcolm Daniel, "Édouard Baldus, *artiste photographe*," in *The Photographs of Édouard Baldus*, 21.

mobilize the medium. As municipal institutions for building commissioned photographers including Quinet to monitor the construction of building campaigns in the metropolis, they also yoked new modes of communication to building campaigns in the capital as the government circulated photographs of the newly transformed city in its publicity campaigns.[5] In the process, building in the metropolis became increasingly subjected to the very visual technologies driving bourgeois industrial expansion.[6]

This chapter deals with the visual and spatial articulations of urban modernization by zooming into an aspect of Quinet's photograph to examine the work involved in crafting the networks of bridges interweaving the Seine into the neighborhood. As part of the extensive bridge building campaigns of central Paris in the Second Empire, photographs would help to promote the bridges within official circuits of imperial spectacle by flaunting the city's visual and industrial prowess as an index of imperial progress. While Quinet's photograph was not created in the context of municipal building campaigns, it nevertheless illustrates the outcome of the government's thoroughgoing intervention into the city's center. More importantly, his image evidences the emergence of equivalencies between the photographic image and the city's urban form, which unraveled as work progressed on the reconstruction of the capital's bridges and they became integrated into the neighborhood.

While Quinet's photograph well illustrates the bridge's assimilation into the metropolis, Bruno Latour has noted that such representations of Paris frequently conceal the role of "thousands of engineers, technicians, civil servants, inhabitants and shopkeepers in making [the

[5] Consider Quinet's photographs of the immersion of the siphon of the Pont de l'Alma of 1896 for the engineers of the Ponts et Chaussées. See ENPC PH397P.

[6] On early photography as a particularly bourgeois medium, see Gisèle Freund, *Photographie et société* (Paris: Éditions du Seuil, 1974).

city] visible" as the images do not disclose the everyday travail of these actors.[7] With the long exposure time of early photography and the startling immediacy of the medium's legibility, Quinet's image erases any traces of the labor invested in the urban transformation of the city's center. We might nevertheless ask: just what kind of work was involved in rendering the city's center visually legible beneath the surface of the photograph?

The city's bridges were a result of a series of protracted historical events stretching back to the eighteenth century. Since that time, the Seine had been gradually transformed into a navigable artery as part of a national system of waterways, leaving behind its former vibrant role in the everyday lives of Parisians who once worked on its shores.[8] Contributing to this process, the Second Empire transformed the length of the Seine running through the city's newly revamped administrative core into a public space and urban promenade. Having harnessed this once unwieldy artery as a leisure space cutting through the city's administrative hub, the state evidenced its conquest over nature through its programmatic transformation of the river, which was yet another linchpin in the government's claims on its triumph over the natural environment.[9]

As part of the colossal task involved in programmatically transforming the Seine, the municipal administration of engineers charged with bridge building in Paris, the Service des Ponts et Chaussées, undertook vast campaigns to build or rebuild eighteen of the bridges in the

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[7] Bruno Latour, *Paris ville invisible* (Paris: Empêcheurs Penser en Rond, 1998), 14.

[8] Isabelle Backouche, *La Trace du Fleuve. La Seine et Paris (1750-1850)* (Paris: Éditions de l'École des Hautes Études en Sciences Sociales, 2000), 333-366. Isabelle Backouche, "From Parisian River to National Waterway: The Social Functions of the Seine, 1750-1850," in *Rivers in History: Perspectives on Waterways in Europe and North America*, ed. Christof Mauch and Thomas Zeller (Pittsburgh: University of Pittsburgh Press, 2008), 26-40.

[9] Save for the annual rise of the Seine's water in the winters, which often led to the flooding, notably in 1910.

city's center from 1850 to 1877.[10] While we often assume that bridges are simply conduits for the unencumbered flow of traffic, the bridges had once played a dramatically different role in the life of the city and their reconstruction in the Second Empire constituted a pivotal achievement in a longstanding project to promote fluid circulation on their roads at street level and on the river below their arches. These efforts contributed to the city's burgeoning capitalist economy in which urban change and metropolitan circulation became naturalized as the state refashioned the neighborhood as an urban landscape, emphasizing the appearance of organic unity between the city and river.

As part of this process, the engineers charged with the bridge campaigns in the Second Empire also integrated photography into their building practices, which would ultimately make it possible to incorporate the newly transformed bridges into emerging networks of official publicity. These engineers began to monitor bridge construction with photography in 1857 and it was at this time when they first called upon the photographer Auguste-Hyppolyte Collard.[11] Collard had established his own photographic studio in the capital in 1856 and, beginning in the following year, he worked steadily in and around Paris for the Service, which named him its

[10] I adopt the dates for these campaigns from Michaël Darin. Darin uses the start date of 1848 when the tolls of the bridges were suppressed. The building campaigns themselves, as Darin points out, began in 1850. Michaël Darin, "Les bouleversements urbains (1848-1877)," in *Les Ponts de Paris*, ed. Guy Lambert (Paris: Action artistique de la Ville de Paris, 2000), 92-100. As Darin also points out, Haussmann scarcely wrote about the bridge campaigns in the second volume of his *Mémoires*. See Baron Georges-Eugène von Haussmann, *Mémoires du Baron Haussmann*, vol. 2 (Paris: Victor-Harvard, 1890), 520-524. The Service des Ponts et Chaussées charged with the bridges of Paris operated under the aegis of the Service de la Navigation de la Seine. As such, these engineers occupied a particular institutional role. While they were placed under the control of the Prefect of the Seine, they also fell under the control of the Ministère des Travaux Publics. See de Pontich, *Administration de la ville de Paris et du département de la Seine*, 422.

[11] On Auguste-Hippolyte Collard, see McCauley, *Industrial Madness: Commercial Photography in Paris, 1848-1871*, 202-232; and Isabelle-Cécile Le Mée, "Collard, photographe des Ponts et Chaussées," *Histoire de l'art* 13/14 (May 1989): 31-45. Collard's personal and professional correspondence not examined by these authors includes a letter from the engineer Émile Vaudrey, dated 17 February 1876, requesting photographs of the bridges of Paris including the Pont de Grenelle, Pont d'Iéna, Pont des Invalides, Pont de la Concorde, Pont des St-Pères, Pont St-Louis, and Pont d'Agricole. See Émile Vaudrey to Auguste-Hippolyte Collard, 17 February 1876, Correspondence of Hippolyte Collard, Lucien Descaves Papers, International Institute of Social History, Amsterdam, The Netherlands, file 449.

official photographer in 1867.[12] For these photographic campaigns, Collard largely worked under the engineer Paul-Émile Vaudrey who was quickly rising in the ranks of the Service des Ponts et Chaussées charged with the bridges of Paris. Vaudrey joined the Service in 1856 and he was named engineer in charge of the bridge campaigns in 1860.[13] He went on to supervise these projects for nearly their entire duration during the Second Empire and the early Third Republic. During his tenure, he consistently called on Collard to document the work of the Service.

From 1857 to 1864, Collard established a standard method for photographing the bridges as he documented the construction of the Pont Saint-Michel, the Pont-au-Change, the Pont de Solférino, the Pont Louis-Philippe, the Pont Saint-Louis, and the Pont de Bercy. With the exception of the Pont de Bercy, located upstream to the east, all of these bridges were part of the Second Empire's building campaigns to complete the network of bridges in the city's center.[14] In 1857, Collard's first commission documented the reconstruction of the Pont Saint-Michel spanning the Left Bank to the Cité. The bridge's rebuilding was part of a campaign to extend its width and connect the new bridge with the *percement*, or aligned street, of the Boulevard de Strasbourg (today the Boulevard de Sébastopol). In 1858, the engineers also rebuilt the Pont-au-

[12] See Collard's business card, Correspondence of Hippolyte Collard, Lucien Descaves Papers, International Institute of Social History, Amsterdam, The Netherlands, file 449.

[13] Vaudrey was first attached to municipal service in 1850 when he worked on street leveling for the Place du Carousel and the Rue de Rivoli. In 1860, Vaudrey replaced Féline Romany as the engineer of the Service des Ponts et Chaussées charged with the bridge campaigns when Romany went on to serve as inspecteur général of the Corps des Ponts et Chaussées. On Vaudrey, see his professional dossier, AN F/14/2335/1; and H. Rousselle and J. Darcel, "Notice nécrologique sur Émile Vaudrey," *Annales des ponts et chaussées* 2, no. 14 (1877): 5-15.

[14] Before 1857, the engineers had already built, rebuilt, or significantly repaired the following bridges in the city center during the Second Empire: the Pont Napoléon III (1852-1853), the Petit-Pont (1851-1853), the Pont Notre-Dame (1852-1853), the Pont d'Austerlitz (1854), the Pont d'Arcole (1854-1856), the Pont des Invalides (1854-1855), and the Pont de l'Alma (1854-1855). 1864 marks a milestone in these engineers' work on the bridges of central Paris. In that year, Féline Romany, who was charged with the bridge campaigns before Vaudrey, published his history of the bridges of Paris, incorporating their work to date. By this time, the administration had drawn the bridge building campaigns in the city center to completion. M. Féline Romany, "Notice historique sur les ponts de Paris," *Annales des Ponts et Chaussées* 4, no. 2 (1864): 127-224. On the bridges of Paris in general, see Jocelyne van Deputte, *Ponts de Paris* (Paris: Editions Sauret, 1994); and Charles Duplomb, *Histoire générale des ponts de Paris* (Paris: Imprimerie de J. Mersch, 1911).

Change linking the Cité to the Right Bank and they again commissioned Collard to document its reconstruction. Taken together, these two masonry bridges helped to formalize a symbolic axis running from the Gare de l'Est to the north and culminating on the other side of the city to the south in the Porte d'Orléans, which strategically linked these new transportation hubs to the very heart of the city.[15] Among the government's many sweeping acts of urban organization, the rebuilt Pont Saint-Michel and Pont-au-Change extended this new axis across the Cité and created a continuous urban *enfilade* stretching across to the Left Bank.

For Collard's next assignment, he moved downstream to the west to document the construction of the new Pont de Solférino. Since 1826, numerous projects had been proposed for a bridge to encourage circulation from the Tuileries to the Left Bank. Finally, the engineers of the Service spanned the crossing with a pedestrian bridge between 1858 and 1859. As such, the Pont de Solférino carried a lighter load and it was built of cast iron whose construction was less costly than a masonry bridge. Between 1860 and 1862, Collard documented the intertwined campaigns to build two bridges on the site of the old Pont Louis-Philippe--a monstrous suspension bridge erected in 1834 that fastened together the Right Bank with the Île Saint-Louis and the eastern edge of the Île de la Cité along an interminable axis. After dismantling the suspension bridge, along with expropriating and clearing nearby buildings in 1860, the Service erected the Pont Saint-Louis and the new Pont Louis-Philippe.[16] The former is the pedestrian cast iron bridge linking the Cité to the Île Saint-Louis to the north and the latter masonry bridge stretches from the Île Saint-Louis to the Right Bank. Collard's final commission, involving a thorough step-by-step documentation campaign, was for the Pont de Bercy, which was built

[15] Girard, *La Politique des travaux publics du Second Empire*, 119.

[16] A letter related to the creation of the new Pont Louis-Philippe notes that expropriation of land and buildings had been authorized to undertake the project, see Prefect to the Emperor, 1 April 1860, Archives de Paris, D2S6/10.

between 1863-1864. By then, the government had largely completed its transformation of the city's center. As the government extended its construction campaigns upstream, the new Pont de Bercy spanned the banks of the Seine in eastern Paris.

This group of six bridges formed a short-lived episode in bridge building in the capital as both the engineers and Collard conventionalized the use of photography within the construction of public works, fastening interlocking ties between photography and civil engineering. For these early campaigns, Collard documented the bridges chronologically and the presentation of his photographs organized these structures as individual monuments that followed the sequence of the construction process. His albumen prints of the individual bridges were produced from collodion-on-glass negatives and gathered in lavish leather-bound portfolios-- a standard format developed for organizing photographs by the mid-1850s.[17] Although the contents of these portfolios vary to a certain degree, the organization of their photographs remains largely standard and tells a recurring story. Unlike Quinet's aerial view, Collard's photographs tightly frame the individual bridges. Indeed, Vaudrey explicitly requested that Collard photograph the bridges in elevation from the quays along the Seine and the photographer's framing of the bridges remained virtually standard among his commissions.[18] From this vantage, Collard captured the bridges' elevations at slight angles, photographing the construction process in full view and thus

[17] While Collard was commissioned directly from the engineers of the Service, the portfolios were assembled by the Commission des Travaux Publics. This institutional body presided over the municipal building bureaucracies, including the Service des Ponts et Chaussées, with Haussmann serving as its titular head as the Prefect. Copies of these portfolios were kept by the building administrations, deposited into French archives, and, in certain cases, exhibited at universal exhibitions. In addition to this standard format, his photographs were also reproduced within additional commemorative albums for universal exhibitions that featured multiple bridges in the same portfolio. Moreover, individual prints frequently cropped up, as did reproductions of individual photographs in the press. Earlier examples of bound albums of photographs include the one of Édouard Baldus for the Chemin de Fer du Nord of 1855, which was commissioned by Baron James de Rothschild and offered to Queen Victoria, see Daniel, "Édouard Baldus, *artiste photographe*," 42-56.

[18] Émile Vaudrey to Auguste-Hippolyte Collard, 17 February 1876, Correspondence of Hippolyte Collard, Lucien Descaves Papers, International Institute of Social History, Amsterdam, The Netherlands, file 449.

furnishing the engineers--and, eventually, the public--with an image that captured the prominence of the bridge in a single photograph. He began by photographing the old bridge slated for demolition and then visually registered the construction of the new structure chronologically to formalize a linear model of progressive evolution that culminated in the bridge's triumphal completion.

As the history of these photographs has been chronicled elsewhere, I will instead move thematically through the sequential narration of the construction process thematically. By adopting the progression of construction as a narrative queue, my goal is not to naturalize its implicit positivist implications, but rather to grasp its importance for the engineers. Understanding the Service's photographic practices within the parameters of the particular circumstances and constraints of the bridge campaigns remains paramount. Although the engineers of the Service integrated photography into a longer process of engineering practice to record their work, they would also begin to circulate these very photographs among broader audiences. In fact, the photographic practices of the Service would concurrently come to inform wider notions about the construction campaigns as the engineers transmitted them within the expanded networks of Second Empire spectacle including universal expositions and the press. Disseminated upon such platforms of official imperial culture, these photographs would render the process of construction with unprecedented immediacy and consolidate monumental conceptions of the bridges on behalf of the state.

In this chapter, I will analyze the photographs of the bridges in tandem with the physical bridges and their urban context. As the engineers of the Service des Ponts et Chaussées mobilized photography for the first time in these bridge campaigns and as the medium itself remained a substantially new technology, its application developed as part of a cross-medium

conversation with other graphic processes. Therefore, I will examine the photographs as they emerged in concert with other forms of representation drawn from civil engineering convention as well as from the popular culture of the period. My purpose here is to consider how the reproduction of these photographs circulated particular meanings about the bridges of Paris and the city's center that helped produce modern conceptions of public space in the Second Empire. Photographs, which were commissioned as part of the bridge campaigns, would ultimately help to tie these conceptions of public space to the desires of city's bourgeoisie. To understand this association, it is necessary to account for how the requirements of the engineers led to the development of representational strategies that structured the photographs and subsequently informed collective consciousness through their transmission.

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Reproducing Memory

Collard's portfolios of photographs generally begin with an image of the bridge slated for demolition, inscribing the old structure into already established and institutionalized modes of historical narration. Take his photograph of the old Pont Saint-Michel of 12 May 1857 (Fig 1.2). The bridge and the river empty out the middle of the photograph. The image concentrates on the old bridge's superstructure with the subtle upward bend on either end of its sloping span, which is also reflected in the water of the river below. To the right, the southern quay of the Seine shoots out from under Collard's feet as it recedes beneath the bridge, running nearly parallel with the row of buildings lining the Left Bank above. To the left, the urban infill of the Cité crawls over the bridge, which is surmounted by the twin towers of the cathedral of Notre-Dame de Paris. As part of Collard's documentation of the old bridge, he also photographed two brass

medallions and a brass plaque for the portfolio and neatly arranged them on the photographic surface (Fig. 1.3) When unearthing the foundations of the old structure, workers led by Vaudrey found the three medals that were struck upon the construction of the old Pont Saint-Michel erected in 1617 under Louis XIII.[19] Collard photographed the excavated objects before the engineers deposited them into the collection of the Musée de Cluny--that "striking spectacle" of history.[20] Taken together, the photographs of the old bridge and its exhumed remnants have been transformed into artifacts that, as historic records, arrest elements of the old city, which were undergoing accelerated changes wrought by modernization.

While François Arago famously heralded early photography's potential as a tool for surveying historic monuments in his public announcement of the daguerreotype process in 1839, architects and photographers working for the Commission des Monuments Historiques, France's institution of architectural preservation founded under the July Monarchy, established the early convention for documenting architectural patrimony with photography. Félix Duban and Eugène Emmanuel Viollet-le-Duc had each commissioned daguerreotypes in 1843 for their respective restorations of the Château de Blois and the cathedral of Notre-Dame de Paris.[21] The

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[19] The old stone Pont Saint-Michel dates from the seventeenth century; timber structures crossed the site earlier. On the history of the various structures spanning the site up through the Second Empire, see Fernand de Dartein, *Études sur les ponts en pierre remarquables par leur décoration, antérieurs au XIXe siècle* (Paris: Béranger, 1907-1912), 179-188. Engineer of the Ponts et Chaussées and important historian of these engineers, de Dartein points out that he used Collard's photographs of the bridge to undertake his study of the structure.

[20] Stephen Bann, "Historical Text and Historical Object: The Poetics of the Musée de Cluny," *History and Theory* 17, no. 3 (October 1978): 255.

[21] On the photographs commissioned by Duban for his restoration of the Château de Blois, see Barry Bergdoll, "Félix Duban, Early Photography, Architecture, and the Circulation of Images," in *The Built Surface: Architecture and the Pictorial Arts from Romanticism to the Twenty-First Century*, vol. 2, ed. Christy Anderson and Karen Koehler (Aldershot: Ashgate, 2002), 1-30. On Viollet-le-Duc's use of photography in his restoration of the cathedral of Notre-Dame de Paris, see Yvan Christ, "Merimée, Viollet-le-Duc et les premiers daguerréotypes de Notre-Dame," *Terre d'Images* 5 (September-December 1964): 644-647; and Lauren O'Connell, "Viollet-le-Duc on Drawing, Photography, and the 'Space Outside the Frame,'" *History of Photography* 22, no. 2 (Summer 1998): 139-146.

Commission subsequently initiated a broader photographic campaign in the famous, so-called, missions héliographiques of 1851. The goal of the missions was to create a photographic inventory of France's architectural heritage in order for the centralized bureaucracy in Paris to be able to identify monuments for future restoration throughout the country. The photographic practices of the Commission coalesced around the desire to conceptualize France's built environment as national patrimony, a notion closely associated with Romantic historiography. Yet, to the chagrin of many photographers involved with the campaigns, the Commission never published the negatives, leaving the episode as an enigmatic experiment in the early institutional applications of the medium.[22]

Under the patronage of the municipal government, photographers regularly documented buildings slated for demolition or renovation in the Second Empire. An early example of this practice included Henri Le Secq's Berger Album of 1853, which was commissioned by then Prefect of the Seine, Jean-Jacques Berger. This practice became standardized once the Service des Travaux Historiques employed Charles Marville to document elements of the urban fabric slated for demolition beginning in the 1850s, subsequently naming him the city's official photographer in 1862.[23] Marville's work for the Service operated as a visual corollary to its

[22] Under the direction of Prosper Merimée, the Commission des Monuments Historiques dispatched Édouard Baldus, Hippolyte Bayard, Gustave Le Gray, Henri Le Secq, and Auguste Mestral to different parts of the country to compile a photographic inventory of France's architectural heritage. On the mission héliographiques, see M. Christine Boyer, "*La Mission Héliographique*: Architectural Photography, Collective Memory and the Patrimony of France, 1851," in *Picturing Place: Photography and the Geographical Imagination*, ed. Joan M. Schwartz and James R. Ryan (New York: I.B. Taurus, 2003), 21-54; Joel Hershman and William Clark**,** *Un voyage héliographique à faire: the mission of 1851: the first photographic survey of historical monuments in France* (Flushing: Queens College, 1981**);** Anne de Mondenard, *La Mission Héliographique: Cinq photographes parcourent la France en 1851* (Paris: Centre des Monuments Nationaux, 2002); and Philippe Néagu, et al, *La Mission héliographique: photographies de 1851* (Paris: Sitecmo, 1980).

[23] On the Service des Travaux Historiques, see Baron Georges-Eugène von Haussmann, *Histoire générale de Paris. Collection de documents fondée avec l'approbation de l'empereur* (Paris: Imprimerie Impériale, 1866). On Marville and his involvement with the Service, see Marie de Thézy, *Charles Marville*. *Photographe de Paris de 1851 à 1879* (Paris: Bibliothèque historique de la Ville de Paris, 1980).

encyclopedic assembly of textual documentation pertaining to the city's history. Joining the documentary archive assembled by the Service des Travaux Historiques, Marville's images forever recorded the old face of the city on the photographic surface, providing a memento for future generations.

In addition to operating within the early municipal tradition of documenting Paris's urban fabric, Collard's photographs also adopt formal conventions common in the work of his contemporaries, particularly Le Secq's. These similarities, however, were not the result of artistic influence or appropriation. Both cameramen shared limitations imposed by the urban fabric when photographing the city's bridges. Thus, in Le Secq's image of the short branch of the Pont-Neuf taken in 1852 for the Berger Album, the photographer stands on the quay to frame the span in full view, just as Collard would do to take his photographs five years later (Fig. 1.4). Yet, Le Secq places greater distance between the camera and the bridge to account for the Pont-Neuf's more protracted span. As a result, the quay cloaks the image's foreground as the span sinks deep into the urban fabric at its extremities, pulling greater pictorial variety into the composition. By contrast, Collard's photographs--whether of an old or new bridge--frame the spans more tightly as a means to isolate the engineer's subject of study.

Indeed, Le Secq was telling a different kind of story in the Berger Album. Here, Le Secq gathered together a range of images of isolated fragments from Paris's urban tissue, which emphatically provoked nostalgia within the context of the brisk changes to the metropolis associated with urban modernization. In addition to his photograph of the full span of the Pont-Neuf, he illustrated a detail of the bridge's massive pier (Fig. 1.5). Rendered in shadowy volume and disembodied from the monumental structure, the pier materialized in the photograph as a ruin, operating within a nostalgic pictorial narrative of the rapidly changing city and its dispersal

of tradition. As Eugenia Parry Janis argues, the melancholia of Le Secq's images results from his ability to capture watery, tonal variation in his photographs.[24] As Janis also underscores, Le Secq was not the unique purveyor of this formal strategy and his images share striking similarities with the etchings of Charles Méryon, which were heavily reproduced in the period.[25] Surely, there is a wide spectrum of resemblances among urban photographs and other kinds of urban imagery. Thus, we find Adolphe Martial-Potémont's etching of the same isolated pier of the bridge, which is rendered in virtually the same manner and made in the same year as Le Secq's photograph included within his collection of etchings of old Parisian architecture (Fig. 1.6). Haunted by the tenebrism of Piranesi, these images of vestigial urban artifacts are saturated by affect and historical longing, which contributed to the veritable cottage industry of artists--not to mention authors--whose work elicited potent, nostalgic responses to the old city within the context of its rapid revision in the period.[26]

Unlike the work of many of his contemporaries, Collard's photographs for the engineers of the Service des Ponts et Chaussées are not uniquely inscribed within these institutional and pictorial regimes of historic memory. Inevitably paired with images of the restored or new structures, his photographs of the old bridges forever reminded their viewers of what stood while championing the newness of the city along with the purported ameliorative implications of the new building campaigns. Nevertheless, Collard's photograph of the old Pont Saint-Michel still

[24] Eugenia Parry Janis, "Demolition Picturesque: Photographs of Paris in 1852 and 1853 by Henri Le Secq," in *Perspectives on Photography, Essays in Honor of Beaumont Newhall*, ed. Peter Walch and Thomas Barrow (Albuquerque: University of New Mexico Press, 1986), 34.

[25] Eugenia Parry Janis, "The Man on the Tower of Notre Dame: New Light on Henri LeSecq," *Image* 19 (December 1976): 13-23.

[26] Discussions of literary representations, which long for the old Paris, are extensive, see, especially, Ferguson, *Paris as Revolution: Writing the Nineteenth-Century City*, 115-151. In relationship to painting and literature, see Clark, *The Painting of Modern Life*, 32. With specific reference to the relationship between photography and literature, see Rice, *Parisian Views*, 1-28.

assigned historical resonance to the changing role of the bridges in the life of the city. If Quinet's photograph of the city's center with which we began displays the bridges as stable structures creating a network for urban mobility, these conduits and the neighborhood into which they were woven had a substantially different appearance and performance before the nineteenth century. Moreover, it is worth recalling that the nostalgic aesthetics elicited by the images of Le Secq, Méryon, Martial-Potémont, and even Collard, reflected a fleeting, Romantic image of the bridges that belies their considerably more protracted history.

Before the nineteenth century, the bridges of central Paris were not only overpasses to be traversed, but also spaces to be inhabited. The bridges were heavily built up with modest shops and residences. The bridges had been occupied since the medieval period and were a locus of commercial activity in close proximity to the Cité, the monarchical, religious, and administrative seat of Paris.[27] The role of these bridges as circulatory passages arose at the end of the eighteenth century when Louis XVI's government passed a royal decree ordering the razing of houses built on the bridges of Paris in September 1786. Yet, attempts to suppress these structures had been stirring long before the crown passed the decree. Concerns about their structural integrity had already raised worries about public safety. In fact, the bridges were often unstable and their outcroppings frequently caused them to collapse. Moreover, Enlightenment critics such as Louis-Sébastien Mercier raised questions concerning the bridges' insalubrity as well as the nefarious activities of their inhabitants. Such critiques of the city's center stretched back to Voltaire's famous condemnation of 1749 in which he lamented that the neighborhood was "dark, narrow, hideous, [and] represents the time of the most disgraceful barbarism."[28]

[27] On the medieval origins of the bridges, see Marjorie Boyer, *Medieval French Bridges: A History* (Cambridge: The Medieval Academy of America, 1976).

As Isabelle Backouche has argued, the impending destruction of the houses under Louis XVI turned the bridges into hotspots of political conflict as their inhabitants "fought vigorously for their rights, asserting both their ancestral claims and their economic dependence on the river for their livelihoods."[29] The state would eventually win out by evicting residences from the bridges up through the first decades of the nineteenth century when the campaigns to clear the houses were completed. For many historians, including Backouche, these campaigns foreshadowed things to come in the nineteenth century, a time in which governments would raze larger and larger portions of the urban fabric, uprooting countless lives in the process.

As the bridges lost their role as places of habitation, the state justified its ambitions to transform them into circulatory conduits according to the logic of the city's burgeoning capitalist economy. Bridge building was traditionally financed from the purses of both city and state. Beginning in the Empire (1804-1814) the government contracted private companies to build and rebuild the bridges of Paris according to the designs of the engineers of the Ponts et Chaussées. In exchange for executing these construction campaigns and for maintaining the bridges, the state allowed these private companies to collect tolls for crossing the bridges, a practice that lasted until the end of the July Monarchy. Until 1848, thirteen of the city's twenty-three bridges were tolled. If new bridge building was increasingly opening up the city's center to circulation, movement within Paris was becoming increasingly aligned with socioeconomics. As Michaël

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[28] "le centre de la ville, obscur, resserré, hideux, représente le temps de la plus honteuse barbarie." François-Marie Arouet de Voltaire, "Des embellissements de Paris," in *Oeuvres completes de Voltaire*, vol. 5 (Paris: Librairie de Firmin Didot Frères, 1855), 390. Both the bridges and the Île de la Cité had long been a target of social criticism. Mercier discusses prostitution on the bridges, see Louis-Sébastien Mercier, *Tableaux de Paris*, vol. 1 (Amsterdam: Virchaux & Compagnie, 1782-1788), 86.

[29] Backouche, "From Parisian River to National Waterway: The Social Functions of the Seine, 1750-1850," 30. See also Backouche, *La Trace du Fleuve. La Seine et Paris (1750-1850)*, 263-269; and Isabelle Backouche, "Les ponts dans la différenciation de l'espace parisien à la fin de l'Ancien Régime," in *La Ville divisée. Les ségrégations urbaines en question. France XVIII^{e}-XX^{e} siècles*, ed. Annie Foureaut, (Paris: Créaphis, 1997), 49-67.

Darin shows, it was the residents of the Left Bank who suffered most acutely from these tolls as the fees severely restricted their movement through the city. While the inhabitants of the Left Bank had vocally protested these tolls, it was only in the wake of the Revolution of 1848 that the tolls were finally abolished.[30]

The suppression of the tolls heralded the fleeting promise of a renewed "right to the city" enacted by Louis Napoléon Bonaparte's short-lived Second Republic (1848-1852), which paid for the contracts on the bridges held by the private companies.[31] However, mounting claims concerning commerce and economic growth would deal the final blow to these tolls. In his seminal essay "De la mesure de l'utilité des travaux publics" (On the Measure of Utility in Public Works) published in the *Annales des Ponts et Chaussées* in 1844, engineer Jules Dupuit laid down his theory of "relative utility."[32] Instead of justifying the benefit of public works on the subjective ground of their rhetorical usefulness to the public, he sought to substantiate their economic value in what would today be considered a kind of cost-benefit analysis. He expanded on this principle in relation to the tolls levied on the bridges of Paris in his article "De l'influence des péages sur l'utilité des voies de communication" (The Influence of Tolls on Transport

[30] As Darin points out, most of the tolls were suppressed by 1853, save those of the Pont Bercy and the Pont Grenelle. Located beyond the municipal limits of the city, their tolls were respectively suppressed in 1861 and in 1866 following the annexation of the communes in 1860. Darin, "Les bouleversements urbains (1848-1877)." On the supression of the tolls, see also de Pontich, *Administration de la ville de Paris et du département de la Seine*, 236. The free passage to and from the Left Bank also carried political implications. As well, the eventual addition of new bridges linking the Île de la Cité to the Left Bank marked the state's reclamation of the Latin Quarter--a neighborhood with a historically semi-autonomous intellectual and political tradition--drawing it into the web of the city center through the image of organic unity, see Girard, *La Politique des travaux publics du Second Empire*, 120.

[31] As Féline Romany points out: "La ville de Paris craignant les conséquences que pouvait avoir pour la tranquillité publique le rétablissement du péage sur les ponts de Paris, avait fortement insisté auprès du gouvernement pour que le rachat fût opéré à frais communs. Sur le refus du ministre des travaux publics de prendre à la charge de l'état la moitié de la dépense, la ville a consenti à se charger seule du rachat, sous la condition que la part de l'état dans l'entretien du pave de Paris serait augmentée d'une somme annuelle de 250 000 francs. Cette condition a été acceptée et les péages ont été racheté." Romany, "Notice historique sur les ponts de Paris, "165-166.

[32] Arsène Jules Dupuit, "De la mesure de l'utilité des travaux publics," *Annales des ponts et chaussées* 2, no. 2 (1844): 332-375.

Systems) published in the *Annales* in 1849.[33] Here, Dupuit explained that those who had focused solely on the revenue generated from the tolls had wildly underestimated the substantially larger market benefits that might be gained by abolishing them. According to Dupuit, the lower the cost of tolls, the more people would use the bridges and thus produce gains for the city's economy. Dupuit thus demonstrated that by removing the tolls, the bridges would increase public utility by increasing commerce, generating what economists call "consumer surplus." In fact, a substantial amount of French economic theory in the first half of the nineteenth century was developed by the engineers of the Ponts et Chaussées to create quantitative standards for public works.[34] In this instance, Dupuit inscribed the bridges--and, by extension, the city--within a theory of space based on the logic of calculation, circulation, and commerce.

As the government abolished the tolls on the bridges, the engineers who were also charged with rebuilding these bridges, along with building new ones, promoted the economic benefits of increased circulation in their bid to transform the city's center. The Second Empire government would subsequently open up the better part of the Cité to circulation, inextricably tying its use and image to the escalating market economy. Under the watchwords of *utilité publique*, the government expropriated the lands of the Cité, ejected the working class, and razed much of the old medieval urban infill over the course of the 1850s.[35] Although spatial segregation would precipitate social polarization, the state had, in theory at least, opened up the streets and bridges of the city's center to unrestricted movement.

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[33] Arsène Jules Dupuit, "De l'influence des péages sur l'utilité des voies de communication," *Annales des ponts et chaussées* 2, no. 1 (1849): 170-248.

[34] Picon, "De l'utilité des travaux publics en France aux XVIIIe et XIXe siècle," 129-136; and Theodore Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1995).

[35] On the law and history of expropriation, see de Pontich, *Administration de la ville de Paris et du département de la Seine*, 256-264.

In this watershed moment in the history of the capital's transformation into modern urban space, universal access to the city's center became associated with the mobility of the metropolis's affluent class. Victoria Thompson has argued that before the Second Empire, the capital's bourgeoisie shared the perception that the Cité was crime-ridden, decrepit, and insalubrious.[36] Fear and anxiety multiplied in the wake of the cholera epidemics of 1832 and 1848 in which the neighborhood witnessed some of the highest death counts in the capital.[37] As poor neighborhoods such as the Cité became "areas of danger" for the bourgeoisie, the Second Empire consequently associated the transformation of the area with the desires and, indeed, the anxieties of the city's affluent classes.

In overhauling the city's center, the government looked to the multiple historic monuments that had long characterized the neighborhood. The government adopted its well-known strategy of *dégagément*, which entailed razing the old urban fabric encroaching upon these buildings and isolating them into a carefully calibrated composition of monumental silhouettes as a means to lay claim to the residual signification of the neighborhood and its monuments.[38] This urban staging constituted the city's new morphological hybridity as it

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[36] Victoria Thompson, "Telling 'Spatial Stories': Urban Space and Bourgeois Identity in Early Nineteenth-Century Paris," *Journal of Modern History* 75, no. 3 (September 2003): 523-556.

[37] Le Mée, "Le cholera et la question des logements insalubres à Paris (1832-1849)," 379-397. These critiques were launched by hygienic reformers and Saint-Simonians in the 1830s. In an article in the Saint-Simonian journal *Le Globe*, Stéphane Flachat argued for the destruction of the tightly knit urban fabric of the city center in order to circulate air as a preventative measure. As part of his proposal, Flachat notably advised moving the working class, which then lived in these quarters, to the *banlieues*, a scheme that Haussmann famously realized. For Flachat's proposition, see Stéphane Flachat, "Le Choléra. Assainissement de Paris," in *Religion Saint-Simonienne: Politique industrielle et Système de la Méditerranée* (Paris: Everat, 1832), 48-49. On the proposals for transforming the city's center made by Flachat and like-minded reformers, see Papayanis, *Planning Paris Before Haussmann*, 151-154; Antoine Picon, *Les Saint-simoniens. Raison, imaginaire et utopie*; and Kevin D. Murphy, "The Historic Building in the Modernized City: The Cathedrals of Paris and Rouen in the Nineteenth Century," *Journal of Urban History* 37, no. 2 (2011): 291.

[38] The previous regime of the July Monarchy had already adopted this strategy to raze the buildings crowding around the Hôtel de Ville. On Parisian urbanism before the Second Empire, see Bowie, ed, *La Modernité avant Haussmann. Formes de l'espace urbain à Paris, 1801-1853*; and Papayanis, *Planning Paris Before Haussmann*. On

exploded from the intimate scale of dense urban tissue into monumental open spaces pervaded by light and compositionally anchored by a monumental building or public sculpture.

Contemporary with the transformation of the city's bridges into a network for urban mobility in the Second Empire, the state also advocated for circulation on the river below the bridges. Consider again Collard's photograph of the old Pont Saint-Michel, which illustrates the span's four, uneven arches that closely straddled the river. The low-slung arches of the city's old bridges historically encumbered river traffic and became impediments altogether as steamships began navigating the river's waters in the 1820s. Efforts to make the arches of the old bridges taller and wider to encourage fluvial circulation were a major impetus behind the bridge campaigns and contributed to protracted historical efforts to transform the river into a national waterway.

In her formative study of the social history of the river, Backouche traces the gradual social processes from 1750 to 1850 underlying the Seine's physical and technological transformation. Backouche demonstrates that the river formerly played an enormous role in the everyday lives of Parisians: they engaged in trade on the bridges and on the river's embankments, they transported themselves and their goods along its waters, and they also came together around the river as a stage for official fêtes and fireworks.[39] Yet, from the mid-eighteenth century onward, sequential governments made enormous strides to convert the river into a national artery. These interventions entailed replacing traditional uses of the river in favor of commercial development. A pivotal step in this process included linking the Seine to the national system of canals launched in the 1820s, which encouraged navigation along the

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the uses of *dégagément*, see Lauren O'Connell, "Afterlives of the Tour Saint-Jacques: Plotting the Perceptual History of an Urban Fragment," *Journal of the Society of Architectural Historians* 60, no. 4 (December 2001): 450-473.

[39] Backouche, "From Parisian River to National Waterway: The Social Functions of the Seine, 1750-1850," 28.

waterway while substantially displacing Parisians' everyday use of the river.[40] Although the development of a national railway system in the July Monarchy subsequently created an alternative network for passenger travel, the river continued to be used for the transportation of heavy cargo.[41]

As the government transformed the river into a national waterway, it also undertook important technological changes to support its use for navigation. As part of the river's programmatic recalibration, the director of the Service des Eaux et Égouts, Eugène Belgrand, oversaw extensive work on inland navigation to transform this unwieldy artery for the sake of encouraging river traffic. By implementing weirs and locks, Belgrand reduced the velocity of the river's currents and deepened as well as regularized the depth of its waters for smoother navigation, much as had been done to the Thames in London beginning at the end of the eighteenth century.[42] With these technological feats that turned the river into an artificial waterway, the stretch of the river running through the city's center became transformed into a veritable canal. Furthermore, the river now produced a heightened visual experience in the city as it created a panorama of boats gliding along its waters, which transported heavy cargo and passed beneath the newly heightened arches of the bridges, while steering clear of any

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[40] Reed Geiger, *Planning the French Canals: Bureaucracy, Politics, and Enterprise under the Restoration* (Newark: University of Delaware Press, 1994). On earlier proposals for improving inland navigation, see Christopher Drew Armstrong, *Julien-David Leroy and the Making of Architectural History* (New York: Routledge, 2012), 239-251. As part of this process, the city's docks were pushed out to the city's periphery in the Second Empire as a means to aid in deindustrializing the city's center.

[41] Backouche, *La Trace du Fleuve. La Seine et Paris (1750-1850)*, 358-359; and Isabelle Backouche, "Disparition des métiers du fleuve," in *La Seine et Paris*, ed. Arnaud Alexandre (Paris: Action artistique de la Ville de Paris, 2000), 96-109.

[42] Backouche, *La Trace du Fleuve. La Seine et Paris (1750-1850)*, 340; and Backouche, "Disparition des métiers du fleuve," 96-109. On the transformation of the Thames, see Stuart Oliver, "The Desire to Metabolize Nature: Edward Loveden Loveden, William Vanderstegen, and the Disciplining of the River Thames," in *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, ed. Nik Heynen, Maria Kalka, and Erik Swyngedouw (London: Routledge, 2006), 93-109.

connection to the social life in the city's center--save for, of course, the *bains froids* in the summer. Ultimately, the Seine's gradual transformation imposed national desires onto the city's center and contributed to the dispersal of local identities.[43]

By opening up the bridges to unencumbered street and river circulation, concomitant means of visualizing the city's bridges as sites for urban mobility arose quickly. As part of this process, Collard developed a series of alternate, but not mutually exclusive, modes for illustrating the bridges. In the instance already examined, Collard historicized the old bridges by exploiting visual conventions that were in line with the photographic practices already institutionalized within the municipal building bureaucracies. Collard would also develop additional visual strategies that linked the new bridges to progressive claims about urban modernization under the very engineers charged with laying these new circulatory conduits that span the Seine.

Reproducing Construction

After photographing the old bridges slated for destruction, Collard subsequently established conventions for illustrating the step-by-step process of bridge construction. This is particularly the case with the documentation of masonry bridges that were fully erected *in situ*; however, cast iron bridges such as the Pont de Solférino and the Pont Saint-Louis had their precast spans delivered to the site and their construction did not follow the same sequence. As the engineers worked over the river's quays and dug into the riverbed, they transformed the Seine into a veritable floating construction site. Collard closely followed major steps in the

[43] On the dispersal of local identities and their replacement by national ones, see Eugen Weber, *Peasants into Frenchmen: The Modernization of Rural France*, 1870-1914 (Stanford: Stanford University Press, 1976).

construction process, suggesting that the engineers stipulated that Collard appear on site to photograph these major events. For these photographs, he typically illustrated four key stages of the construction process by documenting the temporary footbridges spanning the Seine to sustain circulation during construction, the submersion of caissons in the river needed to build new foundation piers, the erection of scaffolding for the centering of the new vaults, and, finally, the preparations for decentering the vaults. By following these sequential steps of the construction process, Collard's photographs propel us into what John Summerson once called the "building world" involving the "social, economic, and industrial" aspects of construction.[44] As part of this phenomenon, these bridge campaigns unfolded within the increasingly media-saturated culture of the Second Empire and Collard's photographs reproduced the construction process across multiple social sectors through their circulation in the professional and popular presses.

Collard's first photograph of the Pont Saint-Michel following this sequence, which was executed on 24 June 1857, illustrates a temporary footbridge made from an enclosed trellised beam that is poised above the river (Fig. 1.7). The image captures a performance of urban theatrics by arresting the ephemeral scenography of the bridge's construction process after workers had labored on the site for ten days to set the overpass in place by rigging scaffolding on a boat. The timber lintel is suspended above the Seine to maintain pedestrian circulation during the bridge's reconstruction. Below this industrial prosthesis, timber falsework frames bolster the superstructure above the Seine during the demolition of the old arches to sustain navigation along the river.[45]

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[44] John Summerson, "What is the History of Construction?" *Journal of the Construction History Society* 1 (1985): 1-2.

[45] On the construction of these temporary elements, see M. Cavé, "Reconstruction du pont Saint-Michel, à Paris. Passerelle américaine provisoire," *Nouvelles annales de la construction* 9 (September 1857): 106-107.

The government's campaigns to extend the Boulevard de Sébastopol concurrently took center stage in the lavishly illustrated weekly journal *L'Illustration*. On 1 August 1857, the journal published an article on the progress of the reconstruction of the Pont Saint-Michel and reproduced Collard's photograph of the footbridge as a wood engraving (Fig 1.8).[46] Through its reproduction, the photograph made these provisional industrial accouterments for the maintenance of urban mobility a permanent part of the city's repertoire of urban iconography. The reproduced image spun together engineering ingenuity and construction prowess with popular visual technologies of mass consumption. Furthermore, the photograph operated in service of the official scripting of modern Paris and contributed to the state's burgeoning publicity machine. From 1852, Napoléon III's authoritarian regime tightly controlled the press and the government ensured that journalists reported on its extensive building projects with adulatory praise.[47] The photograph functioned within the barrage of imperial publicity witnessed in the early years of Napoléon III's reign as the government sought to gain popular favor by encouraging the attitudes and habits of the urban elite among Parisians.[48]

As the government folded the image of the bridge's construction into the language of early mass culture to fashion official imperial culture, the photograph inscribed building process and engineering practice within the dominant cultural values of the bourgeoisie whose readership was reflected in *L'Illustration*. The article accompanying the image situates the bridge within the

[46] The article in *L'Illustration* states: "The drawing on the opposite page was made after a very pretty photograph of M. Collard, photographer, 53 Boulevard de Strasbourg, employed by the Service des Ponts et Chaussées." See *L'Illustration* (1 August 1857): 76. On photographic reproduction in *L'Illustration*, see Thierry Gervais, "Photographies de presse? Le journal *L'Illustration* à l'ère de la simigravure," *Études photographiques* 16 (May 2010): 166-181.

[47] On the press during the Second Empire, see Roger Bellet, *Presse et journalisme sous le Second Empire* (Paris: Armand Colin, 1967).

[48] On the orientation of the Second Empire Press towards the bourgeoisie, see Jean-Pierre Bacot, *La Presse illustrée au XIXe siècle. Une histoire oubliée* (Limoges: Presses Universitaire de Limoges, 2005).

larger campaign to align the structure with the Boulevard de Sébastopol and details the bridge's structural and material specifications, its dimensions, and its process of construction. Notably, the text underscores the rigidity of the temporary timber overpass centralized by the image, assuring its readers that it is tightly secured by masonry at both of its extremities. The image and the article helped to make the city's new forms and materials acceptable. Not only do the article's references to stability underscore the temporary structure's ability to maintain secure circulation by foot and by water during the course of the bridge's reconstruction, but they also reassure the reader of the bridge's safety in the wake of the previous calamities associated with bridge building in the capital.

It is worth recalling that bridge building in the city's center was not always associated with structural integrity. It also merits remembering that the bridges erected by these engineers in the recent past had elicited substantial cultural anxieties. As discussed in the introduction, the Service des Ponts et Chaussée's application of suspension bridges in the city's center was met with considerable criticism after the near collapse of the Pont des Invalides while still under construction in 1827 at the end of the Bourbon Restoration. They nevertheless had continued to build suspension bridges during the July Monarchy. After a series of suspension bridges collapsed--including the one at Angers that took more than two hundred lives in 1850--they placed a virtual moratorium on building suspension bridges for the rest of the nineteenth century.[49] Given the disquiet associated with bridge building, the photograph reproduced in *L'Illustration* and its accompanying article understandably emphasize the building process itself and the structural stability that resulted from it.

[49] In addition, the suspension bridge at Tournon in Ardèche collapsed in 1844 and one at Roche Bernard near Geneva fell in 1852.

While the article and the image evidence the immediate absorption of engineering practice into official publicity, the erection of the temporary footbridge was the only stage of the bridge's reconstruction to appear in the popular press. Yet, subsequent stages in the construction of the Pont Saint-Michel were closely followed in the engineering press. Here, however, Collard's photographs were not reproduced. Instead, Vaudrey provided the professional press with technical drawings to illustrate the footbridge. The plate of images depicting the overpass in the *Nouvelles annales de la construction*, a monthly publication edited by an engineer trained at the École des Ponts et Chaussées, illustrates the temporary footbridge in a series of isolated views in measured elevations, sections, plans, and details (Fig. 1.9).[50] In these images, the horizontal plinth is extricated from its context, save for an elevation that shows the footbridge's suspension over the site. In most of the drawings, the footbridge is abstracted as a rhetorical image that centralizes the "internal dynamics" of its material construction and design. By contrast, Collard's photograph captures the footbridge in the context of the site, straddling the "internal dynamics" of engineering practice and the "broader 'external' meaning or patterns of use" evidenced by the bridge's relationship to its site.[51]

Collard returned to the Pont Saint-Michel's construction site over two months later, on 29 August 1858, during the eleventh day of a fourteen-day process dedicated to laying the first caisson in the Seine (Figs. 1.10). Whereas the footbridge allowed for circulation above the river's surface during construction, these watertight boxes provided workers with a dry space within the river itself to build up the piers of the bridge's new foundations. Vaudrey provided a

[50] C.A. Oppermann edited the *Nouvelles annales de la construction*. M. Lagallisserie and M. Vaudrey, "Passerelle américaine provisoire du pont Saint-Michel à Paris," *Nouvelles annales de la construction* 7 (July 1858): 78-79. On concurrent representational conventions in the architecture press, see Hélène Lipstadt, "The Building and the Book in César Daly's *Revue Générale de l'Architecture*," in *Architectureproduction*, ed. Beatriz Colomina (Princeton: Princeton Architectural Press, 1988), 24-55.

[51] Ben Marsden and Crosbie Smith, *Engineering Empires: A Cultural History of Technology in Nineteenth-Century Britain* (Hampshire: Palgrave Macmillan, 2005), 2.

blow-by-blow account of the arduous task in his site report, precisely tracking the time it took to execute each step of the process.[52] By the time that Collard arrived on the site, workers had already submerged the caisson in the water by rigging fourteen cranes on three boats and on the old structure. Collard would capture an image of the caisson in his photographs of the Pont-au-Change executed in 1858 (Fig. 1.11). Here, the oak skeleton arrived at the worksite by boat before workers submerged the structure in the river. After the workers placed the skeleton in the Seine, they then inserted panels to act as the walls of the chamber. In Collard's photograph of the Pont Saint-Michel, however, work was already progressing underwater as laborers were then in the midst of casting bricks around the caisson to fix it in place externally and digging away at the riverbed from inside the bottomless chamber. Vaudrey again published technical drawings of the process in the *Nouvelles annales de la construction*, which illustrate the caisson as an isolated element fully inserted into the width of the Seine (Fig. 1.12). By contrast, Collard's image discloses the mayhem above the river as cranes balance on boats that are tied together and float on the river. Two days after Collard left the site, the workers then filled up the chamber with Portland cement, which formed the foundations of the bridge's piers.

Collard executed his next photographs of the Pont Saint-Michel on 8 November and 2 December 1857 (Figs. 1.13 & 1.14). These images illustrate the erection of the falsework scaffolding used to support the bridge's new arches between the piers erected by means of the caissons. The footbridge remained situated over the river during the process as workers built up the centering that had been lifted onto the site by cranes. By 2 December, the scaffolding was in place below and workers had already begun laying the new arches upon it in preparation for the striking of the centers. For the decentering process, the engineers had set the falsework frames on

[52] M. Vaudrey "Décintrement et fondation du pont Saint-Michel," *Annales des Ponts et Chaussées* 3, no. 2 (1859): 114-118.

scaffolding. Four small metal cylinders filled with sand, known as sand boxes, sit between the two levels of support, which are just visible in Collard's photograph. The sand boxes have compressible walls with stoppers at their bases; workers slowly removed these stoppers to let the sand flow out of them at a uniform pace. As the sand left the cylinders, their walls descended while gently disengaging and lowering the frame from the new vault. Although the cylinders are in place in Collard's photograph of the Pont Saint-Michel, the process itself would not be undertaken until 7 December of the following week.

The engineer Louis-Alexis Beaudemoulin had developed the latest methods for improving the sand boxes, which Vaudrey adopted, and he elaborated on their advantages in a series of articles published in the *Annales des Ponts et Chaussées*.[53] In discussing Vaudrey's application of the process for the Pont Saint-Michel, Beaudemoulin explained that Vaudrey was pressed for time and he thus sought to decenter the three arches of the bridge simultaneously, a feat achieved by Vaudrey in less than two hours. Had Vaudrey attempted this by earlier means of decentering, Beaudemoulin suggested that he would have had to employ 193 workers and thus would have lost a significant amount of time placing and instructing the enormous work crew. According to Beaudemoulin, Vaudrey only employed eight men at each of the three arches thanks to the sand boxes--twenty-four workers in total.

[53] The application of sand boxes in the decentering process had replaced the previous use of timber wedges. In this earlier process, these wedges sat between the two levels of scaffolding. Workers struck the wedges with hammers, causing the scaffolding to fall and often injuring the workers as it plummeted down into the water. By the 1850s, the use of sand had become standardized, yet engineers were still in the course of improving the technique. Initially, sacs of sand had been employed for the decentering of the arches; however, water dampened the sand and thus made it difficult to extract. The advantages of the sand boxes were thus evident: the process was more efficient than that of the wedges since it required less man power and was, moreover, safer. Furthermore, the boxes improved upon the use of sand bags since they kept the sand dry. M. Baudemoulin, "Sur l'emploi du sable dans les décintriments," *Annales des Ponts et Chaussées* 3, no. 2 (1854): 206-216; M. Baudemoulin, "Décintrement des arches de pont au moyen du sable; perfectionnements," *Annales des Ponts et Chaussées* 3, no. 2 (1857): 222-237. Baudemoulin, moreover, engaged in a debate with the engineer Jules Dupuit over the details of the process, see See, M. Dupuit, "Réponse aux nouvelles observations de M. Beaudemoulin, au sujet du décintrement des ponts au moyen de verrins," *Annales des Ponts et Chaussées* 3, no. 2 (1858): 367-373.

In an article published two years after the decentering of the Pont Saint Michel in 1859, Vaudrey corrected Beaudemoulin's head count by claiming that he had decentered the vaults with only twelve workers and thus further reduced the cost and time involved in overseeing the workforce by placing only four men under each arch.[54] Vaudrey's claim would alarm Beaudemoulin. In fact, Beaudemoulin had visited the site on the day after the decentering. Although Vaudrey was not present, his foremen had apprised Beaudemoulin of the number of men on site. In 1860, Beaudemoulin responded to Vaudrey's article in the *Annales*. Here, he transcribed his site report taken the day after the decentering, which, he claimed, confirmed the number of workers on site for the process.[55] Beaudemoulin would have been pleased to accept Vaudrey's smaller count since he was himself arguing for the efficiency of the sand boxes in the decentering process. But Beaudemoulin, who was in retirement during the course of this correspondence, felt professionally obliged to correct Vaudrey on this matter as well as on other counts. In fact, he deemed it was the "duty of an engineer and citizen, more than an act of criticism."[56]

[54] Vaudrey "Décintrement et fondation du pont Saint-Michel," 114.

[55] Baudemoulin claims to confirm the validity of his report since he had submitted it to his superior shortly after visiting the site. M. Baudemoulin, "Réponse à l'article publié par M. l'ingénieur Vaudrey dans la Chronique des ANNALES DES PONTS ET CHAUSSÉEs, 1859, 4e cahier," *Annales des Ponts et Chaussées* 3, no. 2 (1860): 5.

[56] "Les signaler est un devoir d'ingénieur et de citoyen, bien plus qu'un acte de critique." M. Baudemoulin, "Réponse à l'article publié par M. l'ingénieur Vaudrey dans la Chronique des ANNALES DES PONTS ET CHAUSSÉEs, 1859, 4e cahier," 5. Baudemoulin tells us that his response was published after a six-month delay since the journal did not respond to his initial requests to print his letter.

Reproducing Labor

Vaudrey did not respond publicly to Beaudemoulin's claim. Indeed, Vaudrey was not known for his interpersonal skills. While his superiors lauded him for overseeing the bridge campaigns with "the greatest zeal and great activity," they nonetheless chided him for being "a little too harsh in his relations with the public, entrepreneurs, and even with engineers under his order."[57] We may, however, speculate that this disagreement over the number of men employed for the decentering process held particular ramifications for Vaudrey's application of photography on the construction site that postdate the controversy. Collard's photograph of the decentering process for the Pont Saint-Michel and the Pont-au-Change predate Vaudrey's debate with Beaudemoulin over the man count required for the decentering. In fact, these photographs disclose the worksite in the days leading up to the process and are shot from a distance in line with Collard's standard methods for representing bridges under construction. In albums for masonry bridges postdating this controversy, however, Collard concentrates on the decentering of a single arch as a theater of the construction process in which the number of workers on site is emphasized.

In his photographs of the Pont Louis-Philippe and the Pont de Bercy, Collard zooms closer into the worksite and frames a single arch as the actors of the scene pose to commemorate the pivotal moment of decentering. In his photograph of the decentering of the fourth arch of the Pont de Bercy, a sharp division of labor is revealed among the figures based upon their attire (Fig. 1.15). The engineers, identifiable by their black overcoats, stand nearly over the keystone in

[57] See Vaudrey's personnel report of 1868 in AN F/14/2335/1. The report explains that Vaudrey "continue de diriger son service avec le plus grade zèle et une grande activité… Il est à regretter seulement qu'il apporte un peu trop de rudesse dans ses rapports avec le publique, avec les entrepreneurs, et même avec les ingénieurs sous ses ordres."

the center of the composition. Other figures--largely workmen wearing light-colored clothing, but also engineers--are distributed across the scene, perched on the arch's extrados, sitting on scaffolding, and standing atop the bridge's piers. André Rouillé has argued that Collard's photographs of bridges populated by workers, foremen, and engineers disclose the "social space of the worksite."[58] As Vaudrey exploits photography as a means to objectively document the labor involved in the decentering process, this "world of work" is rendered according to the rational and hierarchical strictures of efficiency and management--"the forces governing the organization" of the figures in these images.[59]

Such attention to the workforce is further evidenced in Collard's documentation of the cast iron footbridges including the Pont de Solférino of 1859 and the Pont Saint-Louis of 1862. While Collard had photographed the sequential stages of the construction of masonry bridges, these footbridges presented Collard with a different set of problems. The engineers subcontracted the fabrication of the cast iron spans. Their parts were manufactured at a foundry in Fourchambault in the Bourgogne region where a local engineer of the Ponts et Chaussées stationed in Nièvre examined and approved them. Afterwards, the spans were shipped to the construction site by water, turning the bridges themselves into products of the national waterways they made possible in the first place.[60] Once the spans arrived on site, the engineers

[58] André Rouillé has argued that the appearance of workers, foremen, and engineers in Collard's photographs reveal the social relations of the construction site with Brechtian realism. According to Rouillé, Collard distributes figures upon particular architectural elements as if in a tableau vivant and conflates architectural symbolism with social hierarchy. In this early study of Collard's work, Rouillé bases his analysis upon three images by the photographer. Looking at a larger corpus of photographs, the engineers are frequently identifiable, but their placement does not consistently support Rouillé's argument. Nevertheless, there is a hierarchical organization of figures within many of the photographs, and I would argue that their dress, to which Rouillé does allude, is consistently more revealing than their possibly intentional placement. In this regard, Rouillé is correct in his claim that the photographs reveal a social hierarchy. André Rouillé, "Les images photographiques du monde du travail sous le Second Empire," *Actes de la recherche en science sociales* 54 (September 1984): 31-43.

[59] André Rouillé, "Les images photographiques du monde du travail sous le Second Empire," 32.
[60] Romany, "Notice historique sur les ponts de Paris," 287.

first built up the masonry abutments and piers, and then posed the cast iron spans in place. For these two footbridges, Collard documented the posing of the cast iron spans, the intrados of the spans, and the completed bridges. As the decentering process involved with the construction of masonry bridges does not figure into the construction process of cast iron bridges, Collard instead turned the posing of the prefabricated spans into a veritable *tableau vivant* of the worksite.

In November 1861, the cast iron span of the Pont Saint-Louis had arrived on site after a minor delay caused by the Seine's unusually low water levels that autumn.[61] The engineers had anticipated that it would take two months to fix the prefabricated span on site, but the task was accomplished in only six weeks and brought to completion around 20 December. Collard documented one phase of the process, which depicts the mammoth span poised on the new piers after workers had hoisted it up from the river below (Fig. 1.16). Although it has already been lifted into position in Collard's photograph, the span nevertheless remains encaged within timber scaffolding. Two towering carts stand on the bridge's temporary roadway and balance upon the giant arch. The carts are set on a rolling track running along the bridge's road and function as a mobile crane. Workers have mounted winches on the carts with cords fastened to the span below. The workers then hoisted up the cast iron member from the river and mounted it in place. Just as the engineers had arrived on site to commemorate the decentering of the masonry bridges, they again assembled across the scene to mark the colossal task of fixing the span to its masonry piers.

These framed views of the worksite, which illustrate the labor of the construction process, developed out of the managerial needs of the engineers and also held further

[61] Romany, "Notice historique sur les ponts de Paris," 289.

ramifications for the representation of public works. Collard seemed to have directly responded to the changing needs of these engineers as he himself began to register images of physical labor more frequently. In turn, Collard's changing practices also impinged upon the profession's graphic conventions, especially with regard to modes of representation found in the engineering press. The professional press regularly illustrated stages in the construction process in single plates containing technical drawings that disclose their subject from a variety of viewpoints and in details; the technical tableaux illustrating the footbridge and the caissons of Pont Saint-Michel published in the *Nouvelles annales de la construction* were typical examples of this synchronic form of graphic representation in which multiple views of the same subject were distributed across the printed page.

By the early 1860s, however, the engineering press began to integrate alternative modes of representing construction. The plate illustrating the Canal Saint-Martin in Paris published in *Nouvelles annales de la construction* in 1861 (Fig. 1.17) offers an example. While the plate also represents multiple images on the same page, its draftsman has forsaken earlier conventions of technical drawings and instead adopted the labor of the construction site as the foci of the five longitudinal sections. In these drawings, workers are scattered across the individual scenes as they sequentially dig into the earth and build up the canal's dam and lock. Although these drawings were not based on photographs, their composition relied upon the emergence of photographic representation in the construction process: their closely framed images, panoramic perspectives, and scenes populated by workers mimic emerging photographic conventions for representing the construction site. However, as much as these drawings depend on photographic representation, they also correct the technological shortcomings of early photography. In the first place, these drawings depict the construction site in pure elevation, a rigorously frontal view that

would have been nearly impossible to capture with a camera given the limitations faced when photographing a waterway. Moreover, the drawings represent workers in the midst of their assigned activities on the worksite. With the long exposure times of early photography, it was not feasible to capture workers in action and it is for this reason that they are posed in photographs. Nevertheless, we may ask why an illustration would disclose the conventions of photographic representation however generalized they might be.

These kinds of illustrations regularly appeared in the engineering press during the 1860s after the engineers had begun to incorporate photography into the construction process. This is not to suggest, however, that images of workers did not previously exist in other kinds of technical illustrations. The engraved and etched plates of Diderot and D'Ambert's *Encyclopédie* were rife with images of manual labor--only of the workshop rather than of the worksite. In these plates, groups of artisans at work served as a mere backdrop to the machines that were the principal foci of these images at a moment when conceptions of industrial culture were closely tied to liberal Enlightenment philosophy.[62] Roughly a century after the first volume of the *Encyclopédie* appeared in 1751, the depiction of workers in the engineering press of course adopted the image of labor for substantially different ends. By the Second Empire, industrial culture had become an entrenched reality of the civil engineering profession. Photography's exposition of the social hierarchy of the worksite now seeped into other forms of engineering illustrations. The engineering press' occasional replacement of its telegraphic technical documents with pictorial representation of the worksite absorbed the question of site

[62] On the issue of labor in Diderot and D'Ambert's *Encyclopédie*, see Ken Alder, *Engineering the Revolution: Arms and Enlightenment in France, 1763-1815* (Princeton: Princeton University Press, 1997), 127-249; Antoine Picon, "Gestes ouvriers, opérations et processus techniques. La vision du travail des encyclopédistes," *Recherches sur Diderot et et sur l'Encyclopédie* 13 (1992): 131-47; Anthony Vidler, "Spaces of Production: Factories and Workshops in the Encyclopédie," in *The Writing of the Walls: Architectural Theory in the Late Enlightenment* (Princeton: Princeton Architectural Press, 1987), 23-33.

management raised by the photograph as a concern of growing importance among these engineers in particular and industrial building culture in general.

Taken together, Collard's photographs illustrating the actors of the worksite along with the images found in the engineering press communicate information about the construction process that goes beyond mere technical exposition. Anthony Giddens reminds us that in industrial capitalism "time--as a quantified form--becomes fundamental to the intersection of class relations within the labour-process."[63] In this visual repetition of the "commodification of space-time" in construction, not only do these images visually track the progress of bridge construction, but they also record the labor invested in that process. As part of this, the photographs diagram the actors on the worksite according to managerial hierarchy. Furthermore, photography was used--at least conceptually--as a means to reduce and regulate labor by imposing a visual and, indeed, virtual system of management in lieu of one in real time. Given that this particular lot of photographs was not used for official publicity and that similar graphic representations appeared in the professional press, it is scarcely surprising that these images reflect the chain of command as it was implemented from the top down.[64] In this regard, these photographs function as "paperwork" that, as a verifiable form of document, supersedes the vicissitudes of verbal and written communication with an ostensibly objective image of managerial oversight and control.[65]

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[63] Anthony Giddens, "Modernism and Postmodernism," *New German Critique* 22 (Winter 1981): 15-18.

[64] In other instances, which will be discussed subsequent chapters, the appearance of workers in construction photographs will take on a political dimensions since those images will circulate among wider audiences.

[65] On paperwork, see Latour, "Visualization and Cognition," 24-26.

Reproducing Space

Once the engineers of the Service de Ponts et Chaussées had drawn their work on the bridges to completion, they enlisted Collard to photograph the monumental structures. Collard photographed each of the completed bridges from the quays, illustrating their elevation and, in certain instances, detailing an individual arch of the longer span. Consider his photograph of the completed Pont Saint-Michel taken at the beginning of 1858 (Fig. 1.18). To take the picture, the cameraman stood in the same location where he had photographed the initial view of the old bridge in May of the previous year (Fig. 1.2). While the compositions of the two photographs remain remarkably similar, Collard captured the crisp articulations of the engineers' urban refurbishment in the second image. The span of the old bridge, with its four arches of uneven sizes, has been superseded by a level crossing supported by three equidistant arches. The quays themselves have also been overhauled. A new staircase leading from the street to the northern quay balances the urban composition. Although vacant in the first photograph, the southern quay receding in front of Collard at the right side of the photograph is now populated by a group of engineers in the distance who have presumably arrived on site to commemorate the bridge's completion. Subtly tracking the fleeting traces of urban change, the photograph pulls distant elements into the orbit of the bridge including the scaffolding erected on the southern tower of Notre-Dame de Paris as part of Eugène-Emmanuel Viollet-le-Duc's and Jean-Baptiste Lassus's restoration.

Collard's photographs of the completed bridges are remarkably homogenous. As he had done with his illustrations of the construction process, he also standardized his compositions for depicting the finished bridges. Collard's stark images of the individual bridges photographed in

elevation are intertwined with two contexts and two spheres of meaning: one is specifically internal to engineering practice while the other carries broader cultural implications. In the first place, the photographs amount to individual representations of isolated structures. When considered within the context of the albums in which they were initially reproduced, the photographs of the completed bridges culminate the sequential narration of the construction of individual bridges. Furthermore, Collard largely abandoned his practice of photographing sequential stages of bridge construction after completing his documentation for the Pont de Bercy in 1864. This decision reflected the frenetic pace of the media. While the popular press reported on the bridges sparingly up until this time, the professional press had closely followed their construction process, particularly that of the Pont Saint-Michel. By the mid 1860s, however, reports on bridge construction also slowed in the professional press. At this time, the engineers of the Service des Ponts et Chaussées had largely regularized the construction method of these bridges. Having established the model according to which subsequent bridges would be constructed, there was little new technical invention to be reported. Thus, while new bridges built after this period were mentioned in the professional press, their construction was not detailed in any protracted manner.

In the second instance, the engineers of the Service des Ponts et Chaussées continued to commission Collard to photograph the completed bridges after 1864; the resulting images circulated among the public and were propelled into a broader field of significance. While these photographs would occasionally appear in the press, Collard also undertook a photographic inventory of fifteen of the capital's bridges that had been built, rebuilt, or merely worked on since 1852. This album of photographs was assembled for display at the universal exposition in Paris of 1867 and contained images previously photographed by Collard alongside new ones

commissioned for the occasion.[66] The municipal government had made substantial progress on the city's urban projects in preparation for the exposition to showcase the arresting changes made to the capital in recent years. As tourists flooded the metropolis to visit the exposition, they were confronted with photographic proxies of the nearby bridges located inside the galleries of the "*Colisée de fer*," the colossal oval exhibition hall built of iron on the Champ de Mars.[67] Exhibited alongside a surfeit of artifacts and images related to civil engineering and architecture, the album displayed photographs of the completed bridges as part of a unified building campaign. Although the individual photographs depict the bridges as structures disembodied from their broader urban contexts, the sequential pages of the album inscribe each individual bridge within a shared episode in the construction of the capital. Following the assumption that the spectacle induced by the photographs of the bridges was coextensive with the urban space created by the structures, it is worth turning to the spatial experience of the bridges before linking the purely visual articulation of the photographs to that experience.

In considering the bridge campaigns on the broadest level, it would be difficult to impose the standards frequently adopted to evaluate the individual monument as a unique architectural achievement. Comparable with the concurrent standardization of the *grands boulevards* and their street walls, the engineers had transformed the bridges into an urban mosaic of background buildings. Of course, the streets of the bridges and of the boulevards share the same three-part

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[66] This album, held by the archives of the École des Ponts et Chaussées, contains photographs of Pont Napoléon III, Pont de Bercy, Pont d'Austerlitz, Pont Louis-Philippe, Pont Saint-Louis, Pont d'Arcole, Pont Notre-Dame, Petit Pont, Pont Saint-Michel, Pont-au-Change, Pont Neuf, Pont de Solférino, Pont des Invalides, Pont de l'Alma, and the Pont-Viaduc d'Auteuil. The album was exhibited in class 65 of the sixth group of the exposition, see *L'Exposition universelle de 1867. Guide de l'exposant et du visiteur avec les documents officiels, un plan et une vue de l'Exposition* (Paris: Hachette, 1866), 139-140. On the favorable reception of these photographs among foreign engineers at the universal exposition of 1867, see Claude Baillargeon, "Témoignages de rivalité industrielle. La France et les photographies de grands travaux d'origine étrangère," *Études photographiques* 17 (November 2005): 16-43.

[67] François Ducuing, *L'Exposition universelle de 1867 illustrée* (Paris: Administration, 1867), 6.

division formed by the central road and its flanking sidewalks, all creating a "uniform gray ground."[68] Yet, while these two building types were both conceived according to the serial regularization and uniformity of their respective architectural elements, their effects in the space of the city are radically different. The seemingly boundless sequence of mural façades of the street walls that sheath the wide, airy avenues--such as the Boulevard des Capucines or the Boulevard de Sébastopol--incorporate regulated elevations and uniform heights in order to frame a lengthy perspective that recedes into a vanishing point typically anchored in an architectural monument.

By contrast, the bridges, which were already cleared of their outcroppings and then thoroughly revamped in the Second Empire, do not create the rigidly framed view associated with the urban corridors of the boulevards. Once their building campaigns drew to completion, the bridges occupied a diffusive role in the space of the city's center, giving shape to its urban fabric while simultaneously falling out of plain sight as they spread out into the city's streets. As the austere, petrous spans overlaid the waters of the Seine in an endless repetition, their similar appearance reflected the engineers' desire to standardize the bridges and their interconnecting streets and quays into a cumulative and cohesive urban vision.[69] When observed from the street level above quays, the bridges established rolling, rhythmic perspectives emphasizing the contrast between water and stone, galvanizing a multiplicity of fleeting views.

The Service des Ponts et Chaussées exerted enormous amounts of energy to fashion these individual structures as part of a collective urban ensemble. From his photographs of the Pont

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[68] Loyer, *Paris Nineteenth Century: Architecture and Urbanism*, 283. Also see Loyer on the development of the street wall as well as Van Zanten, *Building Paris: Architectural Institutions and the Transformation of the French Capital, 1830-1870*, 9-10.

[69] It is worth comparing this urban ensemble to that of the Quartier de l'Opéra, as analyzed by Van Zanten, where the buildings surrounding the Opéra recede to emphazise it. Van Zanten, *Building Paris: Architectural Institutions and the Transformation of the French Capital, 1830-1870*, 6.

Saint-Michel to those of the Pont-au-Change and the Pont Louis-Philippe, Collard's images of the completed masonry bridges appear remarkably homogeneous because the structures themselves shared common structural, material, and aesthetic systems. Beginning with the Pont Saint-Michel, the engineers built these bridges with Portland cement, which was cheaper and easier to produce than Roman cement.[70] The bridges likewise shared common finishes including tar-covered roads lined with granite sidewalks. Moreover, the engineers ensured that the bridges' parapets resembled those of the nearby Pont d'Alma and the Pont de la Concorde. The decorative schemes of the bridges were also standardized; an "N" encircled by garlands of laurel leaves was stamped on the piers between each arch in low relief, and inscribed the bridge campaigns within the imperial patronage of Napoléon III.

The Service des Ponts et Chaussées was also charged with transforming the banks running along the Seine into quays, which further regulated the urban space stretching along the Seine. In a letter sent to the higher administration, Vaudrey made clear that, unlike the bridges, the reconstruction of the quays had little impact on questions concerning navigation along the river. Rather, Vaudrey underscored that their reclamation was undertaken "in the interest of the embellishment of Paris."[71] By creating the neatly articulated quays, these engineers formalized a vertical separation between the city above and the river below as a means to spatially and visually articulate and isolate road from river traffic. Discussing the accomplishment of his colleagues, Léonce Reynaud extolled the planting of trees "artistically arranged along the banks

[70] "Substitution du ciment de Portland au ciment de Vassy dans les travaux hydrauliques," *Nouvelles annales de la construction* 1 (January 1858): 5.

[71] Vaudrey explained that the "reconstructions des quais, réclamées dans l'intérêt de l'embellissement de Paris beaucoup plus que dans celui de la Navigation." Émile Vaudrey to Pierre Magne, 23 August 1858, Archives de Paris, D2S6/16.

of the river" from where "one will discover [the city's] quays and its bridges."[72] In particular, Reynaud emphasized the visual effects created by the accretive ensemble, praising "the widespread and scenic *points de vue*" that resulted from the Service des Ponts et Chaussées's efforts to engineer multiplied, shifting vistas of the Seine along the bridges and quays.[73]

The transformation of the city's center into an urban landscape encouraged fundamentally new social practices in contrast to those that came before. As Backouche and other scholars argue, the neighborhood's new staging had estranged the river from the everyday lives of those Parisians who once depended on the Seine for their livelihoods.[74] Once the old urban infill of the city center was cleared and remolded, the area gave way to interlocking bridges and quays that formed a labyrinthine promenade that weaves into the Seine. The journalist Frédéric Lock succinctly described the effects of these changes in 1867:

> Left to the commercial navigation of wine, stone, asphalt, and other materials, the Seine is only frequented in the season of the *bains froids* by Parisians who otherwise only look at it from above the twenty-five bridges connecting the Right Bank with the Left Bank and the two banks with the islands.[75]

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[72] "Enfin d'autres plantations plus abondantes formeront des jardins publics sur des points convenablement choisis, ou, artistement disposées sur les rives du fleuve, s'associeront heureusement aux points de vue qu'on découvrira de ses quais et de ses ponts." Léonce Reynaud*, Traité d'architecture*, vol. 2 (Paris: Dunod, 1867-70), 595.

[73] "Les lointains et pittoresques points de vue de nos quais." Reynaud*, Traité d'architecture*, vol. 2, 598-99. Reynaud's ideas mirror those of the Saint-Simonians, a movement with which he was involved in the 1830s. On Flachat's related ideas about the transformation of the Seine and its quays, Flachat, "Le Choléra. Assainissement de Paris," 47-48.

[74] Scholars who have built upon Backouche's work include, Darin, "Les bouleversements urbains (1848-1877)," 92-100; and Margaret Cohen, "Modernity on the Waterfront: The Case of Haussmann's Paris," in *Urban Imaginaries: Locating the Modern City*, ed. Alev Cinar and Thomas Bender (Minneapolis: University of Minnesota Press, 2007), 55-75.

[75] "Abandonnée à la navigation commercial des vins, de la pierre, des cailloux de macadam et autres matériaux, la Seine n'est fréquentée qu'en la saison des bains froids par les Parisiens qui, en tout autre temps, ne la regardent que du haut de vingt-cinq ponts faisant communiquer la rive droite avec la rive gauche et les deux rives avec les îles." Frédéric Lock, "Les ponts, les ports et les rues," in *Paris Guide*, vol. 2 (Paris: Libraire internationale, 1867), 1412. Lock is also quoted in Margaret Cohen, "Modernity on the Waterfront: The Case of Haussmann's Paris," 61.

As the bourgeoisie came to use the city center as what Lock called a "picturesque promenade," its new spatial composition precipitated new forms of social relations associated with leisure.

The standardization of the bridges was part of a larger effort to transform the city's center into an urban landscape comparable to the many urban parks also bestowed upon the metropolis during the Second Empire. Like the municipal government's renovations of the Bois de Bologne and the Bois de Vincennes as well as the newly conceived parks such as the Buttes-Chaumont, Monceau, and Montsouris, the *jardin anglais* was the model.[76] Whereas these public gardens created undulating verdant spaces with rocky grottoes of reinforced concrete, the urban landscape running along the stretch of the Seine in the city's center depended on the recalibration of the site within the constraints imposed by the river, however malleable they had proven to be.

The web of overlapping bridges and quays, which the public then used as promenades, created refracted vistas of the urban landscape and, therefore, depended on the conception of the topographic stage derived from English picturesque gardens of the eighteenth century and their emphasis on the shifting views of "peripatetic vision."[77] As at Stourhead, a stone bridge reflecting in the waters of a lake was a visual trope of the picturesque garden, on the one hand, and it also encouraged expansive and unexpected vistas for those passing over the crossing as part of their more protracted itinerary through the garden, on the other. The kind of embodied vision associated with the picturesque landscape garden and its diffuse progeny operate within ostensibly progressive claims about the experiential perception of the individual associated with modern regimes of the self. In Neil Levine's eloquent description of this phenomenon, the

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[76] On the history of the picturesque garden in France, see Dora Wiebenson, *The Picturesque Garden in France* (Princeton: Princeton University Press, 1978). Nicholas Green has traced the development of French attitudes towards the picturesque that underpin the city's parks created in the Second Empire: *The Spectacle of Nature: Landscape and Bourgeois Culture in Nineteenth-Century France* (Manchester: Manchester University Press, 1990).

[77] Yves-Alain Bois, "A Picturesque Stroll around Clara-Clara," *October* 29 (Summer 1984): 34.

picturesque garden forms "an active engagement with the imaginative faculties of the beholder in interpreting and analyzing the specific meaning of the structures in their actual landscape setting."[78] But the acts of viewing privileged by the picturesque garden have historically privileged the experience of certain kinds of bodies over those of others. Consider, for instance, the displacement of agricultural workers triggered by the Enclosure Acts and the privatization of the British countryside at the very moment when the picturesque garden came into existence in the eighteenth century.[79] Following the logic of the picturesque garden, the multiple vistas along the bridges privileged the embodied vision of the bourgeoisie who were intended to circulate in this public space. To accomplish this, the spatial sequence of the city's center incorporated socially coded angles of vision--*points de vue*--through the transformation of the bridges and quays into veritable viewing platforms.

It is worth recalling that the perceptually layered panoramas created by the bridges of Paris also have a particular monarchical heritage. As Ulf Strohmayer argues, once Henri IV inaugurated the Pont-Neuf in 1607, the span formalized an alternative conception of the role of bridges in Parisian city planning. As the first bridge in Paris that was fully paved and erected without houses upon it, the Pont-Neuf encouraged a direct flow of traffic through the city's center. More importantly, the bridge also formalized a new kind of vision: the "royal gaze" of its patron, Henri IV, as the bridge provided an uninterrupted vista of the Louvre from across the

[78] Neil Levine, "Castle Howard and the Emergence of the Modern Architectural Subject," *Journal of the Society of Architectural Historians* 62, no. 3 (September 2004): 348.

[79] See, especially, John Barrell, *The Dark Side of the Landscape: The Rural Poor in English Painting, 1730-1840* (Cambridge: Cambridge University Press, 1984); and Ann Bermingham, *Landscape and Ideology: The English Rustic Tradition, 1740-1860* (Berkeley: University of California Press, 1986).

Seine.[80] But the Pont-Neuf only prefigured the multiplied, scenic views developed by the network of multiple spans erected during the Second Empire.

The unencumbered gaze of the monarch incorporated into the design of the Pont-Neuf was refracted through many lenses in the middle of the nineteenth century. Indeed, the bridges of the new public space of the city's center included views permitting a clear field of vision according to the model of the Pont-Neuf, such as the one created by the *percement* of the Boulevard de Sébastopol across the Cité supported by the Pont Saint-Michel and the Pont-au-Change. But other kinds of views incorporated multiple, overlapping panoramas through the endless superimposition of one bridge after another in the space of the city. As a result, it became increasingly difficult to only associate these bridges with the unique desires of a sovereign as was the case with the Pont-Neuf--at least when considering the Pont-Neuf's meaning at the time of its creation.

The example of the Pont de Solférino illustrates the polysemic meaning of the bridges in Second Empire Paris. The anarchist critic Pierre-Joseph Proudhon questioned if the Pont de Solférino was really erected in the name of circulation or merely as an opportunity to mark the battle won by Napoléon III against Austria in 1859. To prove his point, Proudhon criticized the bridge's blatant celebration of military power with the inscription of the names of the six battles associated with the Second Italian War of Independence on its piers. Proudhon considered the duplication of these same names on either side of the piers facing upstream and downstream to be "laughable." As he quipped: "One would be able to repeat them ten times: this could make a kaleidoscope."[81] However, Proudhon's criticism of the semiotic meaning derived from the

[80] Ulf Strohmayer, "Engineering Visions in Early Modern Paris," in *The City and the Senses: Urban Culture since 1500*, ed. Alexander Cowan and Jill Steward (Hampshire: Ashgate, 2007), 81.

structure's "logocentric decoration" is thrown into question in light of the history of the bridge's development.[82] Plans for a bridge to link the Tuileries to the Left Bank had been proposed since the Bourbon Restoration. However, they were immediately rebuffed because the banks along the river running parallel to the Tuileries on the Right Bank were reserved as a promenade for the royal family, which did not want to permanently open up the walkway to the public.[83] As the Second Empire spanned the crossing with a pedestrian bridge from 1858-1859, the Pont de Solférino finally created an artery for unencumbered circulation between the Latin Quarter and the Tuileries.

While the Pont de Solférino certainly celebrates the emperor as Proudhon suggested, the meaning of the bridge in the life of the city was not monolithic. As the bridge's signification became increasingly layered, it also reified the growing forces of the marketplace, thus underscoring the dispersal of state power--at least as it was traditionally understood--in light of the increasing sway of the city's affluent classes in the Second Empire. In this regard, the urban fabric could no longer be said to be the sole reflection of the sovereign. Instead, the meaning transmitted by urban representation became increasingly volatile in relation to the more stable signification that it bore during the *ancien régime*.[84]

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[81] "On aurait pu tout aussi bien les répéter dix fois: cela aurait fait un kaléidoscope." Proudhon, *Du principe de l'art et de sa destination sociale*, 341.

[82] On "logocentric decoration," see Katherine Fisher Taylor, "The Festival of Justice: Paris, 1849," in *Law and the Image: The Authority of Art and the Aesthetics of Law*, ed. Costas Douzinas and Lynda Nead (Chicago: University of Chicago Press, 1999), 164.

[83] Romany, "Notice historique sur les ponts de Paris," 207.

[84] On the rising influence of the bourgeoisie on urban representation, see Loyer, *Paris Nineteenth Century: Architecture and Urbanism*, 283; Mead, "Urban Contingency and the Problem of Representation in Second Empire Paris," 141; and Van Zanten, *Building Paris: Architectural Institutions and the Transformation of the French Capital, 1830-1870*, 199.

If the bridges of Paris are rife with questions concerning architecture's dispersal of meaning in the Second Empire, the structures themselves did not alone foment this crisis of meaning; rather, it also arose as photographs of them circulated and fragmented their semiotic stability. At the 1867 exposition, the photographs transformed the network of bridges in the city into a sequence of silvery images that established visually mediated encounters with the structures. In the context of its display, the photographic album operated within what Rosalind Krauss has explained as an "aesthetic discourse" that arose in the nineteenth century, which "organized itself increasingly around what could be called the space of the exhibition."[85] More importantly, as engineers grew savvier in their use of photography after 1857, their integration of photography within the construction process explicitly linked the bridges to this space. As a result, engineers not only constructed the photographs according to the "space of the exhibition," but, in concert with Collard, they also crafted the bridges themselves according to this same logic. The integration of photography within the bridge campaigns thus tied these structures to the two different, but not mutually exclusive, spheres of the physical and the virtual. The stakes involved in creating this visual chain of associations, which bound the bridges to these two spheres, are thrown into sharp relief if we recall the particular aspirations of the 1867 exposition and the changing status of Second Empire spectacle.

As David Harvey has argued, the Second Empire's broad employment of spectacle--which is to say publicity, propaganda, and entertainment--explicitly sought to encourage a new

[85] Rosalind Krauss, "Photography's Discursive Spaces: Landscape/View," *Art Journal* 43, no. 2 (Winter 1982): 312. Krauss sets up her discussion of the "space of the exhibition" to isolate the discursive system to which Timothy O'Sullivan's photographs did not belong at the time of their production, linking them instead to science, topography, and, ultimately, the archive. Robin Kelsey has further elaborated on these issues. See Robin Kelsey, *Archive Style: Photographs and Illustrations for the U.S. Survey, 1850-1890* (Berkeley: University of California Press, 2007); and Robin Kelsey. "Viewing the Archive: Timothy O'Sullivan's Photographs for the Wheeler Survey, 1870-74," *The Art Bulletin* 85, No. 4 (December 2003): 702-723.

kind of community that came together around visually dense forms of statecraft.[86] In the first decade of the Second Empire, spectacle operated primarily as a carnivalesque celebration of the imperial regime. Of course, it was in this context that photography was first integrated into the bridge campaigns and the photographic album on display at the 1867 exposition surely helped to make empire more palpable by flaunting the state's industrial accomplishments. But as the regime's glorification of imperial splendor waned after the 1850s and the authority of "capital and commerce" held greater sway during the government's "liberal empire" of the 1860s, the universal exposition staged a new form of virtual community, which emerged as urban modernization fundamentally atomized earlier kinds of social practices that were rooted in the specificities of place.[87] As part of this process, the photographic album of the bridges contributed to efforts to simulate social collectivities through acts of spectatorship that developed according to the conventions of mass culture. These acts, however, were not neutral. As the album left no trace of the bridge campaigns' protracted history, it extinguished and erased the process of "uneven development" which their history entailed.[88] In its place, the bridge campaigns precipitated new social relations in the city's center, which were associated with the desires of the city's affluent classes. Moreover, the photographic album helped to formalize these practices as they tied the bridges to commodity culture within the context of the exposition. As the bridges and their photographs emerged as an integrated episode in the modern urban transformation of

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[86] Harvey, *Paris, Capital of Modernity*, 234-235. For neo-Marxist scholars, official attempts to recreate community through spectacle were not always successful. According to Clark, urban modernization fell short of assembling "an account of anomie with that of social division." Clark, *The Painting of Modern Life: Paris and the Art of Manet and his Followers*, 36. Harvey and Rice have each understood Charles Baudelaire's 1864 poem "The Eyes of the Poor" as a contradiction in Second Empire spectacle and urban modernization since urban circulation also made the poor more visible in the life of the city. Harvey, *Paris, Capital of Modernity*, 220-221; and Rice, *Parisian Views*, 32-37.

[87] Harvey, *Paris, Capital of Modernity*, 205.

[88] On "uneven development," see Neil Smith, *Uneven Development: Nature, Capital, and the Production of Space* (Athens: University of Georgia Press, 2008).

the capital, they arose also within a web of forces assembled by state desires and the logic of the marketplace.

In this chapter, I have explored the variety of uses of Collard's photographs of the bridge campaigns of central Paris and explored their implications for the engineers of the Service des Ponts et Chaussées in particular and modern urban experience more broadly. As this was the first application of photography among these engineers, their uses of the medium proved to be remarkably heterogeneous as they mobilized Collard's photographs to archive the old city, track the construction process and the worksite, and circulate his photographs at sites for official state publicity. For all of the diversity of these applications, they appear to have constituted an important experiment among these engineers. The fact that photography would only become more ubiquitous among municipal engineers during the ensuing decades evidences the success of these early practices. Furthermore, municipal engineers grew increasingly intrigued by the possibilities of photography for civil engineering. In fact, concurrent with the bridge campaigns, photography was taught to civil engineering students at the École des Ponts et Chaussées, the *grande école* for civil engineering in France whose graduates went on to work in state administrations such as the Service des Ponts et Chaussées. This affair and its implications for the broader circulation of construction photography are the subject of the next chapter.

CHAPTER 2. ENGINEERING THE SURFACE

As Collard's photographs for the Service des Ponts et Chaussées responded to the changing needs of municipal engineers working on the bridge campaigns in central Paris, the engineers themselves grew increasingly curious about the potential of the young medium for their field more broadly. Indeed, French civil engineers' adoption of the medium historically corresponded with their discipline's broader institutional reorientation in the middle of the nineteenth century at which time state engineers came to operate according to a distinctively managerial model, which paralleled the Second Empire's bureaucratization of state institutions in general. As a response to the restructuring of their field, which led to a tighter division of labor in their work, it is scarcely surprising that these engineers should explore new techniques and technologies that would aid in their quest to rationalize the oversight and supervision of the worksite to cope with the realities of building within fast-paced construction cycles circumscribed by market demands and state desires. To attend to these changes, these actors recalibrated the techniques and devices that they harnessed together in the service of design and construction, including photography. As French civil engineering was historically anchored in centralized education, the training ground for state civil engineers, the École des Ponts et Chaussées, served as a laboratory for experimenting with the potential applications of photography for civil engineering in this particular professional climate.

From 1858-1911, the École trained civil engineering students in the medium, hired professional photographers to teach the basic applications of the technique, and established a photographic workshop. Although these engineers did not serve as photographers in any official capacity, at least not in the Second Empire, photography was taught at the school to familiarize

engineering students with basic photographic processes and to train them to manage the photographers with whom they worked on the construction site. If photographic training at the École was limited in the period, it nevertheless became a studied subject of engineering inquiry and practice.

At the École, engineers and photographers exerted a considerable amount of energy to aesthetically fashion and technically fabricate photographs according to the procedural directives of French engineering science. In particular, these actors explored the medium for its capacity to function as an objective document for the civil engineering discipline. With its ability to produce impartial and verisimilar representation, the documentary role of early photography appeared as an inherent quality of the medium. Among these engineers, however, the document was a visually reliable artifact because it was a mathematically precise one. Therefore, these engineers probed photography's ability to function as a form of metric representation comparable with other kinds of technical documents mobilized by the profession. By creating compositional equivalencies between photography and other visualization techniques of civil engineering, these engineers systematized photographic applications for the discipline through engineering education and ultimately formalized the photograph's "epistemic relation" with engineering science.[1]

For French civil engineers, modes of representation functioned heuristically and were thus auxiliary to their principal concerns of engineering science. Nevertheless, the ways in which engineers conceptualized photography at the École impacted photography's use in the field. And because these latter photographs circulated among the public, they also permeated multiple social registers that extended beyond the confines of the engineering profession and, as a result,

[1] Michael Lynch, "Science in the Age of Mechanical Reproduction: Moral and Epistemic Relations between Diagrams and Photographs," *Biology and Philosophy*, 6 (1991): 205-226.

they helped to formulate the industrial imagination of the metropolis. Thus, early experiments and applications of photography at the École in the Second Empire offer an important framework for understanding the social meanings that these images transmitted through their circulation.

By reproducing public works in photographs for official publicity and mass consumption, photography assumed a distinct role as media. As such, photography incorporates particular dimensions, as Frederic Jameson tells us, by uniting "that of an artistic mode or specific mode of aesthetic production, that of a specific technology, generally organized around a central apparatus or machine, and that, finally, of a social institution."[2] This chapter takes Jameson's three "conjoined signals" for understanding media through "the material, the social, and the aesthetic" as its organizational spine to reconstruct the significance of the medium for the historical actors who utilized and gave meaning to it as a building document.[3] For, photography made the construction of the city legible within emerging networks of official publicity and consumer culture in the years of the Second Empire.

In this chapter, I will be principally concerned with the internal dynamics involved with fabricating photographs at the École. I will first consider the ways in which these engineers constructed discursive meaning for photography, which they linked to emerging conceptions of technology. I will then turn to the foundations of photographic instruction at the École in the Second Empire to examine the ways in which engineers and photographers fashioned photographs according to the representational conventions of engineering science. While my intention in this chapter is to map the standards developed by engineers and photographers

[2] Fredric Jameson, *Postmodernism, or, the Cultural Logic of Late Capitalism* (Durham: Duke University Press, 1991), 67.

[3] In a volume on early modern technical drawings, Wolfgang Lefèvre has argued for a need to contextually understand the role that such drawings played "for the historical actors themselves, that is, for the mechanicians, engineers, and architects of the age." See Wolfgang Lefèvre, "Introduction," in *Picturing Machines, 1400-1700*, ed. Wolfgang Lefèvre (Cambridge: MIT Press, 2004), 1.

mobilized to craft photographs, I will conclude this chapter by considering the political ramifications of constructing photography as an engineering document. To do so, I will probe the implications of the industrial and bureaucratic aesthetics of these photographs in light of the fact that they circulated among broader audiences within the state's publicity campaigns at universal expositions and in the press.

Epistemologies of Early Photography

As documents of design and construction are themselves material iterations of discursive practices and are illustrative of larger systems of institutionalized knowledge, it is worth considering the historical conceptions of photography that would structure its use at the École. Photography's application among municipal engineers arose in concert with a particular conception of the medium as a form of technology. Early discussions of photography in France assigned it a privileged role as a graphic art. From the very moment that Arago announced the invention of the daguerreotype, photography appeared on the scene as a machine and an applied science. In Arago's report to the Académie des Sciences of 1839, he famously spoke about the possibilities the daguerreotype might afford a variety of documentary applications for cataloguing historic buildings in Egypt and France as well as for astronomers studying the intensity of light in the night sky.[4] As witnessed in his description, these early discussions

[4] For Arago's famous announcement of the daguerreotype on 3 July 1839, see François Arago, "Rapport à la Chambre des deputés," in *La Photographie en France. Textes et controverses. Une Anthologie, 1816-1871*, ed. André Rouillé (Paris: Macula, 1989), 36-42. Elizabeth Anne McCauley has located Arago's interest in the daguerreotype within his own political affiliations and desire to popularize the applied sciences as tools in service of the working class. Elizabeth Anne McCauley, "François Arago and the Politics of the French Invention of Photography," in *Multiple Views: Logan Grant Essays on Photography, 1983-1989*, ed. Daniel P. Younger (Albuquerque: University of New Mexico Press, 1991), 43-69.

inevitably rehearsed its possible applications for diverse fields ranging from the fine arts to the hard sciences and industry.

Arago's seminal exposition was echoed in the description of early photography penned by the civil engineer Léon Lalanne in his 1840 "Essai philosophique sur la technologie" ("Philosophic Essay on Technology") published in the Saint-Simonian organ, the *Encyclopédie nouvelle*. In his essay, Lalanne developed a panoramic conception of technology that elicited notions of social and industrial progress as conduits for the amelioration of everyday life. Mining the etymology of the word, Lalanne pointed to the term's Greek derivation that integrated *logos* (discourse) with *tekhne* (art or métier). While conceding that technology might seem to embrace all of the realms of the arts, Lalanne insisted upon a more restrained definition that was limited to a study of "the science of the processes by which man acts on the forces and materials furnished by organic or inorganic nature and to appropriate those forces and materials to his needs or his happiness."[5]

Lalanne's entry was one of many discursive iterations of the very concept of technology that first emerged as a means of classifying new modes of production sparked by industrialization in the eighteenth century. Johann Beckman, professor of philosophy at the University of Göttingen, popularized the word at the end of the century.[6] The concept of technology subsequently gained currency in France thanks to Gérard-Joseph Christian, the director of the Conservatoire des Arts et Métiers from 1816-1831, who conceptualized

[5] "Mais nous l'appliquerons, dans un sens plus restreint, à la science des procédés par lesquels l'homme agit sur les forces et sur les matières premières fournies par la nature organique et inorganiques, pour approprier ces forces et ces matières à ses besoins ou à ses jouissances." Lalanne's entry in the *Encyclopédie nouvelle* was also extracted into a separate volume as Léon Lalanne, *Essai philosophique sur la technologie* (Paris: Bourgogne et Martinet, 1840), 7.

[6] On the eighteenth- and nineteenth-century origins of the word technology, see Joost Mertens, "Technology as the Science of the Industrial Arts: Louis-Sebastien Lenormand (1757-1837) and the Popularization of Technology," *History and Technology* 18, no. 3 (2002): 203-231; and Eric Schatzberg, "*Technik* Comes to America: Changing Meaning of Technology before 1930," *Technology and Culture* 47 (July 2006): 486-512.

Beckman's ideas for French readers in his *Plan de technomie* of 1819.[7] Continental studies on technology typically differentiated the word "technique" from "technology": the former encompassed the methods and procedures of the industrial arts, while the latter concerned their study and principles. By adopting the phrase "technological processes," Lalanne collapsed the dichotomies that previously existed between the study of technology and its artifacts under consideration.

Lalanne's notion of "technological processes" provided an important departure from earlier classificatory models. Just as Éduoard Charton's *Encyclopédie nouvelle* sought to recast Diderot and D'Alembert's seminal *Enyclopédie* according to a system of industrial knowledge, Lalanne also addressed the shortcomings of the seminal encyclopedia.[8] Lalanne emphasized the flaws of Diderot and D'Alembert's reliance upon a materialist classificatory system based in the natural sciences. The preference assigned to materials as an organizing principle, Lalanne argued, provided a system of knowledge prioritizing natural, rather than human, organization. To correct this, Lalanne turned to an empirical method of classification to emphasize the human developments of "technological processes" and he self-consciously conceptualized them through the fundamentally humanistic discipline of philosophy.[9]

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[7] Following Christian's introduction of the concept to France, writings on the subject of technology flourished and Lalanne's article was one of many on the subject that appeared in the 1820s and 1830s.

[8] For background on the *Encyclopédie nouvelle*, see Barry Bergdoll, *Léon Vaudoyer: Historicism in the Age of Industry* (Cambridge: MIT Press, 1994), 119-122; David Albert Griffiths, *Jean Reynaud, encyclopédiste de l'époque romantique, d'après sa correspondence inédite* (Paris: M. Rivière, 1965); and Robin Middelton, "The Rationalist Interpretations of Classicism of Léonce Reynaud and Viollet-le-Duc," *AA Files* 11 (Spring 1986): 29-48

[9] In a similar vein, Léonce Reynaud, the civil engineer who wrote the entry on architecture in the *Encyclopédie nouvelle*, likewise described the development of architecture through the ages according to construction techniques and thus explained architectural change according to the human conditioning of material form. See Léonce Reynaud, "Architecture," in *Encyclopédie nouvelle*, ed. Pierre Leroux et Jean Reynaud (Paris: C. Gosselin, 1835-1841), 770.

Lalanne's entry in the *Encyclopédie nouvelle* reflected the growing interest in technology as a generative force in industrial society and he in fact cited the daguerreotype and underscored the possible advantages of the new medium for the reproduction and dissemination of the fine arts. Rather than suggest that early photography was an autonomous medium, Lalanne understood it as a machine for artistic propulsion that seeks to "furnish the routes and means of execution," which are "necessary for the culture of the fine arts."[10] Therefore, the daguerreotype arose as one of many proliferating industrial instruments offering fresh nourishment to ensure the growth of cognate disciplines. As a "process of imitation," photography developed in concert with its application in other fields and became aligned with their attendant representational conventions. Nearly twenty years after the publication of Lalanne's entry, engineers of the Ponts et Chaussées built upon the understanding of photography as an artifact of technological development imbued with particular qualities of representation and reproduction as a means to make already existing engineering processes more efficient.

Engineering the Surface

The École des Ponts et Chaussées had long been interested in the integration of emerging technologies of representation and reproduction within its pedagogical practices. The institution had already maintained a collection of drawings, assembled a gallery of models and machines, and also acquired a lithographic press in 1817. Building upon these earlier initiatives, the École amassed a significant collection of photographs of engineering works between 1858-1907 that were donated by state engineers and government institutions, purchased from private collections,

[10] "Une des fonctions le plus importantes de la technologie, consiste donc à fournir les voies et moyens d'exécution, nécessaire à la culture des beaux-arts." Lalanne, *Essai philosophique sur la technologie*, 26.

or obtained through international exchange with foreign colleagues.[11] This archive not only created a sizeable study collection for professors and students at the École, but it also functioned to valorize the use of the medium among engineers in the field.

In addition to building this archive, the École integrated photographic instruction within the school's curriculum beginning in 1858.[12] In that year, the École enlisted Louis-Rémy Robert to teach photography.[13] Robert then worked under Victor Regnault as the chief of the glass-painting atelier at the Manufacture de Sèvres.[14] As the school's directors underscored at the time of Robert's appointment, photography was concurrently "employed at many construction sites, not only to reveal details, but also to record the state of development of construction." The school's administration pointed to the multiple advantages which Robert was to provide as "a man trained not only in the practical knowledge [of photography], but who has quite extensive theoretical knowledge and is, moreover, an artist who has made important works of photography."[15] In their review of Robert's early workshops on photography in 1860, the

[11] For the complete contents of the École's photographic archive, see *Catalogue des photographies anciennes*, 1859-1915, ENPC, PH 500. On photographs in the archive obtained by international exchange, see Claude Baillargeon, "Témoignages de rivalité industrielle. La France et les photographies de grands travaux d'origine étrangère," 16-43; and Claude Baillargeon, "Vattemare and the Transatlantic Dissemination of Photographic Practice," in *The Extravagant Ambassador: The True Story of Alexandre Vattemare, the French Ventriloquist Who Changed the World*, ed. Earle Havens and Pierre-Alain Tillette (Paris: Passage, 2007), 206-215.

[12] For an outline of the school's use of photography, see Gisèle Excoffon and Jean Michel "L'École des ponts et chausses et la photographie," *Photogénies* 2 (September 1983): 6-16. A new and enlarged photographic studio was included in the renovations to the building housing the École located on rue des Saints-Pères in Paris in the 1870s, see *Procès-verbaux des séances du conseil*, March 1876, reg. 5, ENPC, 366.

[13] The head of the school's administration, Cavalier, was already in contact with the photographer Louis-Auguste Bisson to potentially lead students in the instruction in the medium. With Bisson's teaching rates too costly, however, Cavalier sought out an alternative instructor, see Excoffon and Michel "L'École des ponts et chausses et la photographie," 12.

[14] On Robert, see Laurie Dahlberg, *Victor Regnault, Louis Robert, and Photography at the Manufacture Impériale de Porcelaine de Sèvres, 1845-1865* (Ph.D. diss., Princeton University, 1999); and Sam Stourdzé, ed. *Louis Robert. L'Alchimie des images* (Paris: NBC, 1999).

[15] "Le conseil fait le développement qu'elle a pris dans ces dernières années la perfection avec laquelle elle permet de reproduire les monuments de toute espèce. Elle est, dès à présent, employée sur plusieurs chantiers, non

school's directors spoke with enthusiasm about the students' progress in the course. The school's administration was so impressed with this "fecund branch of drawing" that it decided to make photographic instruction a permanent fixture in the school's curriculum and charged Robert with providing three workshops each year to the graduating class.[16]

During the years in which Robert worked with these engineers, photographic instruction remained minimal and it provided students only with a basic familiarity with the medium. Yet, even this nominal training proved useful. In the field, the state's civil engineers regularly demanded particular kinds of images and their familiarity with the means to obtain them ensured their managerial roles. Robert's photographic workshop at the École cast these engineers' expectations for the medium in sharp relief. Robert's notes for his courses at the École focus on the technical procedures for the production of negatives and prints.[17] It is rather in the fragmentary evidence of a handful of extant photographs executed in the school's workshop where a co-dependence between photography and civil engineering developed. Notably, these photographs significantly differ from the concurrent compositional mainstays of early architectural and urban photography including the deep, receding composition emphasizing

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seulement pour relever les détails, mais même pour constater l'état d'avancement des constructions… M. Robert est un homme instruit qui ne possède pas seulement des connaissances pratiques, mais qui a des connaissances théoriques assez étendues, c'est, de plus, un artiste qui a fait d'importants travaux de photographie." *Procès-verbaux des séances du conseil*, April 1858, reg. 3, ENPC, 298.

[16] In 1860, the École gained approval from the Ministère des Travaux Public to formalize Robert's teaching assignment. *Procès-verbaux des séances du conseil*, June 1860, reg. 4, ENPC, 24. Early photography was often referred to as *dessin*, or drawing, in French.

[17] Louis-Rémy Robert, *Notes sur les manipulations photographiques* (Paris: ENPC, 1868). *La Lumiere* reproduced an excerpt of Robert's methods taught to students at the École. See Louis-Rémy Robert, "Manipulations photographiques," *La Lumiere* 37 (10 September 1859): 147.

linear perspective, the topographic view, or the mural composition imitating a section or elevation drawing as recommended in contemporaneous photographic manuals.[18]

The exercises in which Robert led the engineering students included photographing a scale model of a viaduct culled from the school's gallery of models and machines (Fig. 2.1).[19] Students photographed the maquette, comprised of two and one half bays, *en plein air* in the École's exterior courtyard in 1860. A study of structure and ornament, the model exhibits a radical reduction of the colossal proportions of a built viaduct. The background furnished by the fenestrated wall of the École's courtyard dwarfs the model by disclosing the artifact's reduced scale. The object was a serial module that, through the repetition of a measurable unit, would constitute a substantially more protracted structure able to span considerable distances once built. But the photograph nevertheless studies this fragment as an autonomous object. Located in the photograph's middleground, the model is raised just above the soil by three bricks that sit parallel beneath the structure's piers to carry their weight. Moreover, the model is photographed at a slight angle to accentuate compositional depth and to study the object as it recedes in space.

The emphasis placed on the model's angle is further demonstrated by additional photographic studies undertaken in Robert's workshop in the same year. These include two fairly conventional compositions reminiscent of the still-lifes that, executed outdoors, multiplied throughout photography's early history when the medium required natural light. The first specimen is crisp and in sharp focus (Fig. 2.2). Its subject takes a tilted wheelbarrow resting its handles on the dirt of a small parcel of land. The cage of the primitive machine is packed with

[18] See, for example, Henri de la Blanchère, *L'Art de la photographie comprenant les procédés complets sur papier et sur glace négatifs et positifs* (Paris: Amyot, 1859), 5-6.

[19] The extant image of this exercise remains in the form of a paper negative in the photography collection of the Musée Carnavalet. This negative is cited in Dahlberg, *Victor Regnault, Louis Robert, and Photography at the Manufacture Impériale de Porcelaine de Sèvres, 1845-1865*, 97, f. 199.

hay and strewn with shovels and a hammer: these are the tools of the garden, the artifacts of tended soil that litter early photography by serendipitously inhabiting the luminous outdoor spaces required by the young medium.

By contrast, the second photograph is overexposed (Fig. 2.3). The wheelbarrow remains the subject, but it has been rearranged with its handles now in the air and turned to reveal the underbelly of the cart. Additional tools are scattered across the scene: a watering can, for instance, lies on its side just in front of the wheelbarrow. But there are different kinds of objects as well, including a compass and leveling tool propped up against the cart. If the instruments of the tool shed entered the first photograph as if by happenstance, the engineer invades the latter scene through the instruments of his profession. The engineer is thus conveyed iconographically since the photograph's narrative is assembled through a disparate grouping of artifacts.

These photographic studies, entitled *Charrette à bras*, moreover, conjure the double meaning that their name attained in nineteenth-century France.[20] Émile Zola made architecture students renowned for dragging their models through the streets of Paris in wheelbarrows *en charrette* to meet deadlines at the École des Beaux-Arts.[21] As the group of engineering instruments in the second photograph makes clear, these photographs were indeed the charrettes of engineering students who faced similar toils at the École des Ponts et Chaussées with its competition based exercises integrated into the school's curriculum. In fact, these engineers had already adopted such iconography. In the year that the École acquired a lithographic press in 1817, it published a collection of student drawings and illustrated a charrette on the publication's

[20] I am grateful to Claude Baillargeon for suggesting that I consider the double meaning of the title of these photographs.

[21] Émile Zola, *L'Oeuvre* [1886] (Paris: Fasquelle, 1967), 61-63.

frontispiece (Fig. 2.4).[22] Conceived as civil engineering charrettes, these photographic exercises presented the École's students with an opportunity to collaboratively search out a solution to a shared problem.

With the photographs' emphasis on the rotation and spatial depth of the wheelbarrow, the images resemble the graphic conventions of the engineering profession. As Bruno Latour argues, engineers frequently seek to establish optical and discursive consistency by means of what he calls "a series of inscriptions" that are developed through an accumulation of graphic procedures.[23] By ensuring visual likeness among the range of documents that accrue over the course of the design and construction process, these "inscriptions" facilitate managerial efficiency by tightening the relationship between the conception and realization of a project. The engineers of the Ponts et Chaussées mobilized photography for many reasons: it replaced written reports, remotely surveyed construction, provided a means to study technique, and also functioned as a publicity device. The ways in which the photograph was fashioned would prove to be central to its ability to support its multiple functions. In Robert's workshop, engineers developed a means to construct the photograph according to the conventions of other representational procedures associated with civil engineering.

The principal subject of these compositions, namely the wheelbarrow, or, more precisely, the placement of the cart with its diagonal slant and projective composition, corresponds to the ways in which Robert instructed his students to reveal multiple surfaces of the object through serial photographs. The angle of the turning of the cart, just as the angle with which the model

[22] École des Ponts et Chaussées, *Collection de 350 dessins, relatifs à l'art de l'ingénieur et lithographiés à l'École royale des ponts et chausses* (Paris: ENPC, 1817). On the use of lithography at the school, see Antoine de Charleville Raucourt, *Mémoire sur les experiences lithographiques faites à l'École royale des ponts et chaussées de France* (Toulon: Aurel, 1819).

[23] Latour, "Visualization and Cognition" 1-40.

was photographed, appeal to specific graphic operations associated with contemporaneous imaging techniques used by these engineers. By visually studying the multiple angles of the cart, these photographs simulate forms of parallel projection such as axonometry and thus function within a particular paradigm of viewing associated with engineering science.

Metric Images

Although cartography dominated their representational techniques in the eighteenth century, engineers trained at the École subsequently privileged various forms of parallel projection that multiplied in the wake of Gaspard Monge's development of descriptive geometry at the end of that century (Fig. 2.5). While oscillating between the flat surface of the page and the depth of its representation, this graphic method depicts three-dimensional objects in movement by means of the mathematical precision of two-dimensional lines. Ideally, the technique would graphically demonstrate the process of generating a given geometric form. At the time of its invention, the method provided the visual counterpart to the institutional emphasis placed on pure science and mathematics within technical education during the revolutionary period. By visualizing the transparent language of numbers as a democratized expression of building knowledge, descriptive geometry became fastened to the sturdy political scaffold of French universalism. Descriptive geometry provided a ground upon which these engineers transformed the technical drawing into a quasi-mechanized process that subordinated the contingencies of the hand's movement to the protocols of mathematical logic. The two-dimensional page not only provided the plane off of which these engineers projected structures into space, but it also served as a mechanism to precisely gauge the translation of that projection into built form according to

the precisions of quantification--thus tightening the connection between the conception and realization of a project through an intimately aligned relationship between mathematical rationality and representation.[24]

But as Antoine Picon and Joel Sakarovitch both argue, descriptive geometry never proved to be very convincing in the design of buildings or machines. As Picon writes, its instruction "had more to do with the mental habits of order and precision than it tended to establish."[25] Consider the case of Louis Bruyère who integrated the instruction of descriptive geometry into his course on construction and stereotomy at the École des Ponts et Chaussées.[26] His class served as the basis for his publication *Études relatives à l'art des constructions* of 1823-1828. Here, Bruyère engaged descriptive geometry to analyze the arch of the Pont de Trilport on the River Marne (Fig. 2.6). The bridge, however, was constructed from 1756-1760, decades before Monge's development of the technique. Bruyère pointed out that no documents related to the study of the arches existed in the papers of its engineer, Antoine de Chezy.[27] He nevertheless adopted descriptive geometry to analyze the design of the arches, applying *a posteriori* logic to explain the structure's design to his students and readers. Bruyère thus anchored his analysis in descriptive geometry even if the technique was not employed to generate the form of the original bridge.

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[24] As Alberto Pérez-Gómez has explained, Monge's invention permitted the very conception of building to be "transformed into universal projections that could then… be perceived as reductions of buildings, creating the illusion of drawing as a neutral tool that communicates unambiguous information, like scientific prose." Alberto Pérez-Gómez, "Architecture as Drawing," *JAE* 2 (Winter 1982): 3.

[25] Antoine Picon, "From 'Poetry of Art' to Method: The Theory of Jean-Nicolas-Louis Durand," in *Précis of the Lectures on Architecture: With Graphic Portion of the Lectures on Architecture* (Los Angeles: Getty Publications, 2000), 27; and Joel Sakarovitch, *Epures d'architecture: De la coupe des pierres à la géométrie descriptive, XVI - XIX siècles* (Basel: Birkhäuser, 1998), 347.

[26] On the origins of teaching descriptive technology at the École, see Antoine Picon, *L'Invention de l'ingénieur moderne*, 273.

[27] Louis Bruyère, *Études relatives à l'art des constructions*, vol. 1 (Paris: Bance Ainé, 1823-1828), 9.

Not only had descriptive geometry attained the status of an "epistemological model," but so too had the projective drawing generally.[28] Take the meditation on drawing proffered by the illustrious engineer of the Ponts et Chausseés and former pupil of Jean-Nicolas-Louis Durand, Léonce Reynaud. In his widely-read *Traité d'architecture*, of 1867-1870, based upon his courses on architecture at the École Polytechnique and the École des Ponts et Chaussées, Reynaud assigned a primary role to the drawing within his materialist history of building. In this publication, Reynaud expanded upon the thesis he previously set forth in his famous entry on "Architecture" published in 1840 alongside Lalanne's article in the *Encyclopédie nouvelle*. There, he argued that industry, science, and art proceed in concert and reveal themselves within the changing construction methods of every society.[29]

Before launching his exhaustive description of building materials in the first volume of the *Traité*, Reynaud lauded drawing as the constituent element of all building at the end of the tome's introduction. "One usually represents a building or a part of a building by its projection onto horizontal and vertical planes," wrote Reynaud to define drawing most generally. Citing the plan, section, and elevation, he further counseled that "it is indispensable to have recourse to this method of study for a project" and that these drawings were to be rendered in a manner "as explicit and as striking as possible."[30] Returning to his discussion of drawing in the second volume of the *Traité*, Reynaud homed in on perspective as the most important graphic modality:

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[28] As Alberto Pérez-Gómez and Louise Pelletier write of descriptive geometry, the method served as an "epistemological model for the acquisition of truth." Alberto Pérez-Gomez and Louise Pelletier, *Architectural Representation and the Perspective Hinge* (Cambridge: MIT Press, 1997), 305.

[29] Reynaud, "Architecture," 770. For an analysis of this article as it related to concurrent architectural theory, see Robin Middleton, "The Rationalist Interpretations of Classicism of Léonce Reynaud and Viollet-le-Duc," 29-48. As Middleton points out, the origins of the article date to 1834.

[30] "On représente habituellement un édifice ou une partie d'édifice par ses projections sur des plans horizontaux et sur des plan verticaux… Il est indispensable d'avoir recours à cette méthode pour les études d'un projet." Reynaud, *Traité d'architecture*, vol. 1, 16.

> If he could see mentally in space with great exactness, the architect would immediately represent the conception of his spirit by the means of a perspective drawing, determined from the point of view that he was to have chosen, and, after having assured himself of the fidelity of this expression of his thought, he would have no more than to convert the perspective into a geometric drawing to obtain the exact measurements necessary for the execution of the work.[31]

The notion that design is first perceived as a mental process can be traced back to the fifteenth century when Leon Battista Alberti asserted that buildings are "conceived in the mind, made up of lines and angles, and perfected in the learned intellect and imagination."[32] With this claim, Alberti famously associated building with the intellectual pursuit of the architect as humanist. How remarkable that Reynaud should subsequently identify perspective drawing as the ideal visual manifestation of a mental image.[33] In fact, perspective drawing contained such acute precision for Reynaud that he went so far as to advise that this "is the drawing to which we are obligated to attach ourselves first quite rather than the object itself."[34] Although perspectival drawing was by no means an innovative technique in the nineteenth century, it nevertheless conveys precise information visually though a rhetorical vision of a building that suppresses certain aspects of a structure for the sake of representing others with greater clarity. In the

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[31] "S'il était donné à l'homme de voir mentalement dans l'espace avec une grade netteté, l'architecte représenterait immédiatement la conception de son esprit un moyen d'un dessin perspective, déterminé d'après le point de vue qu'il se serait choisi, et, après s'être assure de la fidélité de cette expression de sa pensée, il n'aurait plus qu'à convertir la perspective en un dessin géométrique, pour obtenir les mesures exactes nécessaires à l'exécution de l'oeuvre." Reynaud*, Traité d'architecture*, vol. 2, 53.

[32] Alberti is quoted in Mario Carpo, *The Alphabet and the Algorithm* (Cambridge: MIT Press, 2011), 21. For the original quote, see Leon Battista Alberti, *On the Art of Building in Ten Books*, trans. Joseph Rykwert et al. (Cambridge: MIT Press, 1988), 7.

[33] René Descartes also proposed that an idea first emerges as a mental image, see Desmond Clarke, *Descartes' Theory of Mind* (Oxford: Oxford University Press, 2005), 63-66; and Dalia Judovitz, "Vision, Representation, and Technology in Descartes," in *Modernity and the Hegemony of Vision*, ed. Davin Levin. (Berkeley: University of California Press, 1993, 63-86.

[34] "En réalité, c'est au dessin que nous sommes obligés de nous attacher d'abord bien plutôt qu'à l'objet lui-même." Reynaud*, Traité d'architecture*, vol. 2, 54.

nineteenth century, the primacy Reynaud assigned to perspective contributed to a quest to anchor design convention in calculation and representation. For Reynaud, this coupling would ensure unflagging precision in the final execution of a given project. But that the engineer should privilege perspectival drawing reflected a desire to align metric drawing with human perception, albeit in an idealized form.

While Reynaud reconciled quantification and representation through perspective, his student at the École, Auguste Choisy, probed graphic representation for its capacity to represent buildings in a manner that superseded human vision. Choisy's well-known adoption of axonometric projection formalized the drawing's ability to register a verisimilar representation of structure in space (Fig. 2.7).[35] By projecting orthogonal lines that remain parallel rather than meeting at a vanishing point, axonometry created a uniquely spatial form of graphic representation that appeared suspened on the page. Explaining the axonometric drawing, Choisy writes:

> The graphic documents, sometimes simplified by the suppression of superfluous details are, for the most part, presented in axonometric projection, a system that is clearer than perspective and of more immediate measure. In this system, only one image moves and is animated like the building itself, lending in place of an abstract figuration, disposed according to plan, section and elevation.[36]

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[35] Auguste Choisy began his *L'Art de bâtir chez les Romains* of 1873, in which he first used axonometry, as a student at the École des Ponts et Chaussées under the tutelage of Léonce Reynaud. Choisy's last research for the publication dates to 1867 and its completion dates to 1868. The fall of the Second Empire caused a delay in its publication, see Fernard de Dartein, "Notice sur la vie et les travaux de M. Auguste Choisy," *Annales des Ponts et Chaussées* no. 31 (May-June 1910): 10. As de Dartein also explains, Choisy executed these drawings at a large scale and subsequently reduced them photographically before they were engraved. On Choisy's use of axonometry, see Thierry Mandoul, *Entre raison et utopie. L'Histoire de L'Architecture d'Auguste Choisy* (Wavre: Mardaga, 2008), 111-162; and Thierry Mandoul, "From Rationality to Utopia: Auguste Choisy and Axonometric Projection," in *Perspective, Projections, and Design: Technologies of Architectural Representation*, ed. Mario Carpo and Frédérique Lemerle (London: Routledge, 2007), 151-162.

[36] "Les documents graphiques, quelquefois simplifies par la suppression de détails sont, pour le plus grand nombre, présenté en projection axonométrique, système que a la clarté de la perspective et se prête à des mesures immédiates. Dans ce système une seule image mouvementée et animée comme l'édifice lui-même, tient lieu de la figure abstraite fractionnée par plan, coupe et élévation." Auguste Choisy, *Histoire de l'architecture*, vol. 1 (Paris: Gauthier-Villars, 1899), 48.

By projecting these three formative drawing procedures into a single, albeit abstracted, representation with axonometry, which maintains the right angle while distorting the diagonal, Choisy seamlessly rendered a synthetic view of the subject both visually and mathematically. The method thus exemplified an important paradigm shift in viewing that had broken away from perspectival conventions. Axonometry departed from perspective with its emphasis on the fixed point of the lofty spectator who, as Yves-Alain Bois underscores, assumes "the place of the sovereign from which to assess the sphere of his dominion, the dimension of his knowledge, and the extent of his power."[37] By shattering the lone spectator's vision into the multiplication of views of the object, axonometric drawings assign agency to the object itself and erase the vicissitudes of human perception through their mathematical precision. The importance of axonometry's mathematical accuracy was central to its growing use since in the 1820s when it was adopted to illustrate machines and fortifications.[38] Based in mathematical rationalization, these static images would trump embodied visual perception with all of its imperfections in an ongoing quest to standardize and rationalize representation.[39]

Choisy's adoption of axonometric projection has been assigned a privileged position in subsequent histories of modern architecture. Indeed, Choisy persisted in the use of axonometry

[37] Bois, "Metamorphosis of Axonometry," 45.

[38] Rosemarie Bletter makes this point. See Rosemarie Haag Bletter, "Representing Architecture: The Drawing and the Photograph," *Architecture California* 14, no. 1 (May 1992): 11. As Bois points out, axonometry dates back centuries earlier and was used by the Chinese. See Bois, "Metamorphosis of Axonometry," 42. On the popularization of axonometry in England beginning in the 1820s, see Bois, "Metamorphosis of Axonometry," 54; and Mandoul, *Entre raison et utopie. L'Histoire de L'Architecture d'Auguste Choisy*, 127-128.

[39] On embodied vision in the nineteenth century, see Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge: MIT Press, 1990).

to standardize the mode of representing buildings throughout his oeuvre.[40] Much like Bruyère had accomplished through his mobilization of descriptive geometry as a means to study the arch of a bridge, Choisy sought to tell a particular story about the history of architecture through his application of axonometry. In his publications, Choisy refracted architectural history through the lens of the present to establish a theory of architecture for the industrial age. His use of axonometry only furthered his cause. Operating in the rationalist tradition of his mentor, Reynaud, Choisy splayed technical information across the printed page to visually study the materials and construction techniques of buildings through his use of axonometry. In the process, Choisy created visual equivalencies between buildings from disparate times and places by rendering them with the same graphic method.

Engineers trained at the École deployed a range of graphic modalities ranging from descriptive geometry, perspective, and axonometry to diagram the intersection of duration, movement, and space on a two-dimensional plane. Whether mobilized as a form of communication from designer to builder, as a study of three-dimensional form, or as a mere presentation drawing, these stripped-down images performed particular labors. As we have seen, their effectiveness was not always at stake; rather, it was their ability to conceptualize information into a rhetorical image that operated as a quasi-mechanical tool that attracted these engineers to these processes.

[40] Choisy's histories of architecture and his use of axonometry was of particular interest to Le Corbusier and this connection was taken up most notably in Reyner Banham, *Theory and Design in the First Machine Age* (London: The Architectural Press, 1960), 23-34. On Le Corbusier's interest in Choisy, see Richard Etlin, "Le Corbusier, Choisy, and French Hellenism: The Search for a New Architecture," *The Art Bulletin* 69, no. 2 (June 1987): 264-278.

Sites of Production

By capturing depth of field, photography is adroit at simulating perspective. Indeed, concurrent experiments in photogrammetry that engaged the medium to survey buildings and landscapes evidence photography's intrinsic alignment with perspective.[41] As an abstract graphic method, however, parallel projection is not inherently reproduced in the composition of a photograph, as the images undertaken in Robert's workshop do not succeed in quantifying their subjects. Rather, civil engineering fashioned photographs according to the conventions of graphic representation in general, and parallel projection in particular, as mechanisms for conveying mathematical information visually.[42]

While this likeness was only achieved by standardizing the photographic composition, the multiplication of alternating views of an object through serial photographs mimics the temporal duration of the movement of an object in space. Thus, Robert and the students in his workshop arranged individual objects such as models and wheelbarrows as photographic charrettes in which they studied the spatial rotation of these autonomous objects with natural lighting that emphasizes their surfaces in the vein of axonometric drawings. By doing so, the adoption of

[41] On photogrammetry, see Aimé Laussedat, *Recherches sur les instruments, les méthodes et le dessin topographique*. 2 vols (Paris: Gauthier-Villars, 1898-1903). Gustave le Bon, better known for his theories of crowd psychology, attempted to popularize Laussedat's developments in photogrammetry for surveying monuments: "In a mechanical and instantaneous fashion… an engineer, an architect, an officer, and even a simple amateur would be able to make all of the measurements for monuments, works of art, and fortifications, and transform photographic images deformed by perspective into a geometric image," See Gustave le Bon, *Les levers photographiques et la photographie en voyage* (Paris: Gauthier-Villars, 1889), 1. On the use of photography for topographic surveys in the American context, see G.W. Pearsons, "Photography Applied to Surveying," *Journal of the Association of Engineering Societies* 9 (January-December 1890): 189-193

[42] Both historians of science and historians of photography underscore that photography's role as an objective document in the nineteenth century was socially produced. See Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007), 115-190; André Gunthert, "La Rétine du savant. La Fonction heuristique de la photographie," *Études photographiques* 7 (May 2000): 30; Josh Ellenbogen, "Camera and Mind," *Representations* 101 (Winter 2008): 86-115.

parallel projection as a compositional practice in these photographs carried particular ramifications for photography that united photomechanical reproduction with mathematical rationalization.

The photographs produced in Robert's workshop suggest that the state's civil engineers did not understand photography as an autonomous medium, but rather as a technique of engineering design. These photographs were a part of the paper trail of documents--or, what Latour calls "inscriptions"--that also included construction and technical drawings, models, maps, cost estimates, and calculations. Taken together, these documents accumulated over the course of the design and construction process as part of an attempt to tighten managerial control over a project. Among these engineers' ongoing efforts to create links between diverse aspects of engineering science, their attempts to associate photography with technical drawings sought to codify the photograph's "epistemic relation" with engineering knowledge more broadly.[43]

The collaborations of engineers and photographers extended beyond the walls of the school. The instruction the École's offered in emerging technical processes such as photography was intended to prepare engineering students for the practical application of such techniques in the field. Following the logic of centralized state education, the small-scale mobilization of photography at the École helped shape the large-scale deployment of photography on the worksites of modern Paris. In this context, the institutional environment of the École structured patterns of production and reception of these photographs. As engineers deployed photography on the worksite to create model bureaucratic documents, they did so within the framework codified at the epistemic level of engineering pedagogy.

[43] Michael Lynch, "Science in the Age of Mechanical Reproduction: Moral and Epistemic Relations between Diagrams and Photographs," 205-226.

These exchanges between engineers and photographers resounded in the contemporaneous application of photography in the field commissioned by the Service des Ponts et Chaussées. Like Collard's photographs of the bridges of Paris, the photograph of the viaduct model simulates the ideal vantage point to capture the maximum structural information possible along the slanted elevation of the object within the frame of the image. In Collard's hands, photographs of the bridges repeated these conventions uniformly. The photographs of the wheelbarrow undertaken in Robert's workshop, however, mirror additional practices associated with Collard's work in the field for the Service des Ponts et Chaussées.

As part of his bridge commissions in the early 1860s, Collard began to photograph the intrados of the cast iron spans once they were set in place on site, a process illustrated in a photograph of the Pont Saint-Louis taken once the bridge's construction was completed in 1862 (Fig. 2.8). The photograph depicts the underbelly of the cast iron arch springing out of its masonry pier on the Right Bank of the Seine. A series of trusses running parallel to one another follow the curved contours of the intrados and leap into the foreground of the image. As the span climbs upward, it saturates the photograph's surface and stretches beyond its edges as if to convey a limitless field of vision. At the same time, the photograph lucidly anatomizes the cast iron span's structural system. Likewise, technical drawings of the bridge reproduced in the *Annales des Ponts et Chaussées* in 1863 illustrate a longitudinal section and an elevation of the span that both integrate the projecting intrados of the bridge (Fig. 2.9). The engineers carefully monitored the structural performance of cast iron bridges. Before and after cast iron spans were fixed on site, they underwent rigorous series of structural examinations. Collard's dynamic photograph succinctly diagrams the structural work of the arch by visualizing forces of stress and compression, and thus underscores the structural work of the projecting intrados. As much as the

photograph emphasizes the intrados's structure, the image's raw display of industrial bravado cannot be denied.

Indeed, such images conventionalize the dynamic, projective graphic language of the engineer within the repertoire of urban iconography of modern Paris. Yet, such photographs only generalize themes of engineering science; they do not produce them. Thus, while Picon concedes that a "systematic use of images" is a "general characteristic of engineering," he cautions that "images are not what matters ultimately in the study of social and engineering imagination." For Picon, "social imagination" is "what organizes and regulates the flow of these images." It is a "deep layer" that "has more to do with ethical positions that generate representations of what is good, fecund, and productive in the physical world." Picon, moreover, ascribes a dual nature to this condition, one that functions as a "justification of the present state of society" and another that is inherently utopian in orientation.[44] Picon's analysis of the use of representations among engineers articulates the ways in which images operate according to the internal logic of the discipline. When analyzed in this vein, the photographic practices of these engineers at the École and in the field reproduce notions about quantifiable forms of rationality inherent in graphic representation such as descriptive geometry and axonometry. For them, such associations attest to the fidelity that they themselves assigned to calculation as a rational, privileged method of design and territorial organization.

In the Second Empire, official discussions of the benefits of photography among civil engineers routinely insisted on the practical advantages of photography as a documentary tool to track the construction process and to enable offsite surveillance for the promotion of bureaucratic procedure. This official commentary, however, raises two dilemmas. In the first place,

[44] Antoine Picon, "Engineers and Engineering History: Problems and Perspectives," 431-432.

photographs did not do the same work as technical drawings; rather, these photographs helped to facilitate increased managerial control over building. Thus, the technical aesthetics of the photographs also became the aesthetics of bureaucracy. In the second instance, the deployment of photography by these engineers was never uniquely directed to the planning and design processes of civil engineering. As we saw in the last chapter, these photographs were often enmeshed in the state's publicity campaigns once they became circulated at sites for the production of official state culture including the press and universal expositions. Through their aesthetic fashioning and reproductive nature, photographs were not merely bureaucratically advantageous, but they were also ideologically useful to the state.

The strategic marketing of these photographs, which arose simultaneously with these engineers' initial interest in the medium as a managerial tool, poses one of the fundamental dilemmas involved in assessing the work of a centralized administration of state engineers: Can their labors ever be fully unhinged from the political desires of the government that both supported and directed their work, including their mobilization of photography? Studies of engineering devices and processes have long proliferated in the tradition of French technical history with little concern for the political context in which these methods were produced. However, the circulation of engineering photographs beyond the confines of the French engineering field necessarily linked them to government authority, raising broader questions concerning the political content of these ostensibly objective images along with the intentions of the engineers who commissioned them, particularly as the photographs proved to reflect the desires of the state. Indeed, such questions are not specific to the French context. As Robin Kelsey argues, Timothy O'Sullivan's photographs of the American west for the Wheeler campaigns of the early 1870s also integrated the graphic conventions of the Army Corps of

Military Engineers. Similar to the photographic practices of the engineers of the Ponts et Chaussées, O'Sullivan's photographs would also prove to be useful as promotional images for his patrons.[45] And yet, the photographs of public works commissioned by engineers pictured the city's industrial bravado and were generative to the construction of the capital.

As these photographs circulated from their field of production to broader cultural arenas, they still transmitted their technical virtuosity. In their travels, these photographs transmitted their orthogonal lines, their projecting vaults, and their soaring spans. The traces of the labor invested in both the production of the photographs and the construction of public works together saturated the photographic surface with the language of technical and industrial culture. As a result, the visual language of the photographs operated within the parlance of the engineer as a technical expert. Often mobilized in concert with calculations, statistics, maps, and technical drawings, photographs functioned as technological artifacts by facilitating the organization of industrialized building culture. The photographs, moreover, reified technology visually. It is scarcely surprising that these engineers--whose field privileged technical concerns--should develop a visual language that stressed their industrial and technological orientation. Nevertheless, the technical aesthetic of these photographs merits further exploration since they also enhanced the authority of the state through their circulation. In the context of the Second Empire, politics and industrial development became deeply enmeshed in notions about imperial progress. Yet, the vast industrial culture promoted by the Second Empire government shrouded itself in claims on the universality of technical thinking while distancing itself from questions concerning political agency.[46]

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[45] Kelsey, "Viewing the Archive: Timothy O'Sullivan's Photographs for the Wheeler Survey, 1870-74," 717-718.

[46] See, for instance, Friedrich August Hayek, *The Counter Revolution of Science: Studies on the Abuse of Reason* (Indianapolis: Liberty Press, 1979).

Notably, it was during the years of the Second Empire when engineers themselves became understood less and less as individual actors and assumed a collective identity as a profession. Thus, while Balzac's criticism of the engineers of the Ponts et Chaussées focused on a central protagonist in the 1830s, the terms of the critique of these engineers shifted in the Second Empire. Closely echoing Balzac's assertion that engineers "have lost the sense of elegance and ornament," Proudhon wrote in 1865 that "the engineer admires the machine's power, its solidity, and the efficiency of its spring; in one word, the idea: a few moldings added to the rooms, a few costs for elegance and embellishment… mean nothing to him."[47] Yet, the political context of the Bourbon Restoration that framed Balzac's earlier criticism disappeared from Proudhon's censure of the engineer. Moreover, Proudhon has erased any discussion of the engineer as an individual and instead addresses the actor as an abstract persona. In the context of the Second Empire, at which time the construction of public works in the metropolis contributed to the realization of class-specific desires, the subsuming of the engineer's individual identity to his membership in the profession carried political ramifications as industrial culture became conflated with imperial progress.[48]

In returning to the photographic practices of the engineers trained at the École, we would be remiss to ignore the broader political implications of the technical aesthetics of these images. In the photographs that they commissioned, engineers not only exploited technology as a representational strategy to align the medium with their graphic conventions, but also to inscribe the photographs within its universalizing narratives. With all of the assumptions about

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[47] "L'ingénieur admire dans une machine la puissance, la solidité, l'économie de ressorts ; en un mot l'idée : quelques moutures ajoutées aux pièces, quelques frais d'élégance, d'embellissement, comme ces figures met à la proue des navires, ne signifient rien pour lui." Proudhon, *Du principe de l'art et de sa destination sociale*, 181.

[48] On the political uses of industry in the Second Empire, see Girard, *La Politique des travaux publics du Second Empire*, 15-20; Harvey, *Paris, Capital of Modernity*, 248-260; McCauley, *Industrial Madness: Commercial Photography in Paris, 1848-1871*, 227-232.

technology's self-propelling progress, the discourse of technology established a potent language of power that reified the desires of the state in the silvery photographs themselves. Whether or not engineers intended their images to operate according to the political aspirations of the Second Empire government, they nevertheless materialized on the photographic surface and served the purposes of the state through their dissemination.

It is important to recall that in the Second Empire, technical aesthetics had not permeated French culture to the degree that they would later in the Third Republic. The veritable novelty of the image of industry along with innovation of the medium itself in the Second Empire also imbued these images with an aura of progress. While not addressing photographs commissioned by these engineers explicitly, Proudhon nevertheless reminds us of the "glistening" halls of industrial artifacts encountered at industrial expositions in the 1860s that even "eclipse the expositions of painting and statuary." The critic, moreover, recalls that these objects carry a particular ideal for engineers as well as for industrialists and entrepreneurs of all kinds. "The ideal for them is summed up in two terms," writes Proudhon, "the superior quality of the *product* and the reduction of the minimum *cost* of production." For Proudhon, "the synthesis of these terms is *richesse*."[49] While *richesse* does not constitute art for the critic, he explains: "it must not be forgotten… that *richesse* is also an aesthetic element."[50] Here, then, Proudhon provides the

[49] "Allez aux expositions de l'industrie, devenues si brillantes, qu'elles éclipsent les expositions de la peinture et de la statuaire: qu'est-ce qui fait l'idéal de ces industrieux, de ces manufacturiers, de ces métallurgistes, dont les entreprises, par leur splendeur et leur immensité, ont bien quelque droit aujourd'hui de prendre en dédain les pauvretés de l'art contemporain? L'idéal pour eux se résume dans l'union de ces deux termes: qualité supérieure du *produit*, réduction au minimum des *frais* de production, termes dont la synthèse est richesse." Italics are Proudhon's. Proudhon, *Du principe de l'art et de sa destination sociale*, 181-182.

[50] "Je sais bien que la richesse n'est pas l'art… Mais il ne faut pas oublier non plus que la richesse est aussi un élément esthétique." Proudhon, *Du principe de l'art et de sa destination sociale*, 182.

crux of meaning elicited by the technical aesthetic of engineering photography in the Second Empire: the engineer's technical achievement was made to appear sumptuous.[51]

While Second Empire luxury is synonymous with the thick masonry and stone mantles that cloaked the constellation of monuments and boulevards, the city's extensive technical accouterments also elicited the government's vast spending and association with the capital's affluent classes. The street walls of the boulevards and concrete grottoes of Jean-Charles-Adolphe Alphand's parks contained the capital's complex technical apparatus comprised of networks of gas and water pipes, conduits of electric and telegraph lines, systems of underground sewers, and frameworks of structural iron that were often out of plain sight. It would be for the Third Republic government to imbue the city with new material references to science and technology as urban performances of a newly sanctioned universal language of liberal republicanism.[52] To do so, the government encouraged a considerably greater visible flow of industrialization to impregnate urban form and counter, on representational terms, the Second Empire's allusions to the stone shrouds of the Roman urban imperium. But the city's industrial apparatus had long occupied a privileged position as a pervasive theme of the modern city and it gained unprecedented exposure within the expanded horizons of Second Empire spectacle. And engineering photography offered one of the first glimpses into the capital's industrial imagination.

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[51] Louis-Alphonse Davanne reminds us that municipal engineers dispensed considerable amounts of state funding on their photographic campaigns. Louis-Alphonse Davanne, "Rapport sur la XI˚ exposition de la Société française de photographie," *Bulletin de la Société française de photographie*, vol. 22 (Paris: Gauthier-Villars, 1876): 261.

[52] On the adoption of science and technology as the official architectural and urban language of the early Third Republic, see Debora Silverman, "The Paris Exhibition of 1889: Architecture and the Crisis of Individualism," *Oppositions* 8 (Spring 1977): 71-91; Debora Silverman, *Art Nouveau in Fin-de-Siècle France: Politics, Psychology, and Style* (Berkeley: University of California Press, 1989), 1-5; and Miriam Levin, *Republican Art and Ideology in Late Nineteenth-Century France* (Ann Arbor: UMI Research Press, 1986).

In this chapter, I have examined the integration of photography into the curriculum at the École des Ponts et Chaussées. Furthermore, I have argued that the adoption of the medium entailed the crafting of compositional affinities between photography and other graphic processes associated with engineering science in general and projective drawing in particular. While the establishment of these compositional similarities made photography legible according to the conventions of engineering science, it also formalized engineering photography's particular aesthetics of administration and industry. These aesthetic practices did not only resound within the world of the engineer's labor; once circulated among broader audiences, these photographs also conjured notions of Second Empire luxury, which linked the photographic practices of the engineers of the Ponts et Chaussées both to state aspirations and the consuming habits of the city's affluent classes. If the very notion of technology developed out of the industrial revolution and subsequently became tethered to the democratic language of French universalism in the revolutionary period, engineers exploited photography to craft technology as part of the spectacle of Second Empire Paris produced for the bourgeoisie. In the next chapter, I will return to municipal engineers' applications of photography in the field where, in the 1860s and 1870s, the medium emerged in concert with the dramatic revolution in hydraulic engineering as part of the capital's modernization.

CHAPTER 3. GROUNDWORK

Deep beneath the urban floor in the sewers of Paris, Félix Nadar executed one of the most enigmatic photographs of the city in the nineteenth century (Fig. 3.1). In the center of the composition sits a laboriously posed mannequin fashioned as a sewerman outfitted with beard, cap, and knee-high boots for wading through the city's muck. Immersed within the shadowy, barrel-vaulted space, the inanimate figure is surrounded by an incoherent network of ducts, pipes, beams, chains, and pulleys. In order to maintain the sewers of Paris, sewermen operated a sluice system comprised of gates, carts, and boats to periodically flush out of the underground galleries' waste, which they pushed toward a dump site located to the north of the city.[1] Nadar's photograph illustrates the manually operated sluice cart, which he ingeniously staged for the occasion to meet the challenges posed by the arduous conditions of the underground environment. Although Nadar illuminated the sewer's tunnels with artificial electric light, their light levels remained so dim that the photograph required an eighteen-minute exposure time. Nadar thus substituted for a live sewerman a mannequin, whose inanimate corpse would remain still for the duration of the exposure.[2]

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[1] On the sewers of Paris, see Donald Reid, *Sewers and Sewermen: Realities and Representations* (Cambridge: Harvard University Press), 1991, 27-36; and Jean-Pierre Goubert, *The Conquest of Water: The Advent of Health in the Industrial Age* (Cambridge: Polity Press, 1989), 63-67.

[2] Furthermore, Nadar turned to retouching the photograph, a practice that he often avoided, but found necessary in this instance. Sylvie Aubenas, "Beyond the Portrait, Beyond the Artist," in *Nadar*, ed. Maria Morris Hambourg, Françoise Heilbrun, and Philippe Néagu (New York: Harry N. Abrams, 1995), 100. For Rouillé, photographs of workers in the Second Empire frequently subsume these actors within the industrial scenery on display. The effect is exacerbated in Nadar's image as the worker--here, a mannequin--is a literal accessory, which is "interchangeable with the objects" in the image. Rouillé, "Les images photographiques du monde du travail sous le Second Empire," 34. Rouillé's argument is in line with Marxist critiques of the worker's role in capitalist society more broadly. Consider the comments of André Gorz who notes that industrial labor turns "workers into appendages of the megamachines of capital." André Gorz, *Ecologica*, trans. Chris Turner (London: Seagull Books, 2010), 29. Comparable to "the organs of a body or the components of a machine," the worker has been absorbed into the apparatus of capitalist production. This reasoning not only underpins the replacement of the sewerman to emphasize

Nadar wrote that the underground sewers were a "deformed labyrinth of bilges and entrails to defy the imagination of Piranesi."[3] Nevertheless, the photographer must have felt a certain kinship with the draftsman in view of their mutual fascination with tenebrous, subterranean aesthetics. In Piranesi's haunting *Carceri*, drawbridges, gallows, and suspended catwalks emerge out of the smoky atmosphere of Italian Baroque stagecraft. In the mid-eighteenth century, however, Piranesi could not have known the steely technical accouterments of nineteenth-century sewage engineering captured by Nadar's image. And yet, by conjuring the ghost of Piranesi, Nadar also established an artistic lineage for his own photographic practice.

The photograph is one of twenty-three murky views of the sewers that Nadar executed in the winter of 1864-1865 and served as a pendant to his series of seventy-three photographs of Paris's catacombs executed from 1861 to 1862.[4] Nadar spoke of these two journeys into the bowels of the city as interrelated episodes involved with his own personal quest to push the limits of the photographic medium by visualizing the city in unexpected ways. Furthermore, he discussed his explorations below the city as a counterpart to his photographic voyages high above the metropolis as he famously took flight in his *Géant* in 1863 and photographed blurred bird's-eye views of the city from the hot-air balloon.

Although Nadar methodically framed his sewer photographs in terms of his own photographic practice, an alternative reading of these photographs emerges in consideration of

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the industrial setting of the sewers, but it also resonates with the fact that Nadar substituted the worker for the sake of the technical constraints of the photograph itself. In this case, the requirements of the image subjugate the worker, pointing out that the photograph also operates within a form of capitalist logic.

[3] "un enchevêtrement difforme de sentines et boyaux à défier l'imagination de Piranèse." Félix Nadar, *Quand j'étais photographe* (Paris: Ayer, 1889), 122.

[4] Maria Morris Hambourg, "A Portrait of Nadar," in *Nadar*, 32-33.

his anecdotal *Quand j'étais photographe* of 1900. [5] Here, Nadar wrote that his sewer photographs were an "homage" to "the eminent engineer of our sewer construction," Eugène Belgrand.[6] But these photographs were not merely a "homage" to the engineer. In fact, Belgrand officially commissioned the photographer to document the city's sewers in his role as the director of the city's Service des Eaux et des Égouts, a position he held from 1854 until his death in 1878.[7] Appointed by Haussmann, Belgrand remained one of the Prefect's closest professional collaborators during the Second Empire and continued in his post after Haussmann had left office in 1870. As part of his duties, Belgrand oversaw the creation of the city's new network of sewers, which channeled the raw sewage that formerly ran through the city's streets. Furthermore, he spent the bulk of his energy masterminding the city's water sourcing and

[5] On this publication, see Rosalind Krauss, "Tracing Nadar," *October* 5 (Summer 1978): 29-47; and Stephen Bann, "'When I was a Photographer': Nadar and History," *History and Theory* 48 (December 2009): 95-111. The photographer had already likened these events to each other in his 1867 essay "Le Dessus et le dessous de Paris" in which he assumed the voice of an adept tour guide, leading his reader on narrative expeditions above and below the city. Félix Nadar, "Le Dessus et le dessous de Paris," in *Paris Guide*, 1569-1592.

[6] "l'éminent ingénieur de nos constructions souterraines," Nadar, *Quand j'étais photographe*, 129. See also the letters surrounding the commission in the Bibliotheque Nationale, Eugène Belgrand to Félix Nadar, Collection d'autographes formée par Félix et Paul Nadar, NAF 24626 f. 62; and Letter from Félix Nadar to Eugène Belgrand, Collection d'autographes formée par Félix et Paul Nadar, NAF 24988 f. 66-67.

[7] Because Nadar's sewer photographs propelled the urban subterranea into the visual field, urban historians have assigned his photographs a privileged position as documents of the city's modernization. Donald Reid, who has written extensively about the sewers, has argued that Nadar's efforts to visualize the underground galleries fed a veritable cottage industry of spectacular representations of the sewers in the Second Empire that, ranging from public tours and guidebooks to Victor Hugo's 1862 *Les Miserables*, galvanized the hitherto unknown underground city into an urban imaginary of the newly modernized metropolis. Reid, *Sewers and Sewermen: Realities and Representations*, 37-52. Acknowledging Reid's analysis, Matthew Gandy has taken Nadar's images as a point of entry into a discussion of the relationship of the sewers, along with Belgrand's waterworks more broadly, with urban nature: a complex nexus of technology, nature, and culture. According to Gandy, the moment in which Nadar's photographs were taken saw a tension between the desire to modernize the city and inherited premodern notions about nature including dirt, wretched smells, and disease. For the author, Nadar's images remained a sign of the Second Empire's "uneven development" since access to public water was fully democratized in Paris in the 1890s. The relationship drawn by Gandy between the sewer photographs and public access to potable water is not a tenuous one given that it was the Service des Eaux et des Égouts that oversaw these twin activities (although Gandy does not discuss the new water sourcing and distribution system). Moreover, Nadar's photographs do depict the water pipes in perspectival recession, which carry the city's water supply along the underground sewer tunnels. Matthew Gandy, "The Paris Sewers and the Rationalization of Urban Space," *Transactions of the Institute of British Geographers* 24, no. 1 (1999): 23-44.

distribution system, which provided two separate channels of water for Parisians: one for public use and another one, which distributed fresh spring water, for private consumption.[8] Taken collectively, Belgrand's responsibilities involving the city's sewage system along with its water sourcing and distribution network reflect the twin subjects of hydraulic engineering, which both rely upon the principle of fluid mechanics to control the constant flow of liquids.

The mythic aura surrounding Nadar's sewer photographs, one that the photographer helped to generate, has outshined their role in Belgrand's larger project. In fact, image production constituted an important aspect of Belgrand's work that, in addition to the sewers, visually recorded the comprehensive system for sourcing and distributing water for the modern metropolis.[9] It is a surprise that this visual documentation has been largely neglected since there is no dearth of scholarship on the role of waterworks in histories of the city's modernization. Indeed, their very ubiquity owes to the fact that Belgrand penned a meticulously detailed account of the work of the Service des Eaux et des Égouts in the heavily reproduced *Les Travaux souterrains de Paris*, which was published in five volumes from 1875 to 1882.[10] While Belgrand's extensive technical exegeses on the city's waterworks have provided an important

[8] Lalanne points out that Belgrand spent the bulk of his energy on the city's water sourcing and distribution system, see Léon Lalanne, *Notice sur la vie et les travaux de E. Belgrand* (Paris: Dupont, 1881), 25. On Belgrand and the Service des Eaux et des Égouts, see Belgrand's professional dossier, AN F/14/2165/2; Philippe Cébron de Lisle, "Belgrand et ses successeurs. Les eaux et les égouts de Paris," in *Le Paris des Polytechniciens. Des ingénieurs dans la ville (1794-1994)*, ed. Antoine Picon, Bruno Belhoste, and Francine Masson (Paris: Délégation à l'Action Artistique de la Ville de Paris, 1994), 175-183; Jean Gay, *L'Amélioration de l'existence à Paris sous le règne de Napoléon III. L'Administration de service à l'usage public* (Geneva: Droz, 1986), 15-31; Goubert, *The Conquest of Water: The Advent of Health in the Industrial Age,* 61-67; Jordan, *Transforming Paris*, 267-97; Pinkney, *Napoleon III and the Rebuilding of Paris*, 105-126; and de Pontich, *Administration de la ville de Paris et du département de la Seine*, 463-469.

[9] The publication *L'Eau et Paris* reproduces extensive archival photographs undertaken as part of the work of the Service des Eaux et des Égouts; however, its text is comprised of extracts from Belgrand's publication and Haussmann's *Mémoires* with neither historical nor analytical treatment of the material. Nicolas de Cointet, ed. *L'Eau et Paris* (Paris: Editions Albin Michel, 2009).

[10] Eugène Belgrand, *Les Travaux souterrains de Paris*, 4 vols. (Paris: Dunod 1875-1882). Harvey notes the extensive scholarship on the subject; yet, he does not correlate it with Belgrand's publication. Harvey, *Paris: Capital of Modernity*, 251.

documentary source for subsequent historians, the substantial visual component of the volumes has largely escaped scholarly attention.

Published at the dawn of photoengraving, which facilitated photographic reproduction in books, Belgrand's volumes, along with four accompanying atlases, are lavishly illustrated with photographs along with copious drawings, maps, and charts. For the publication, Belgrand sieved through his bountiful archive, which he had amassed over the course of the 1860s and 1870s.[11] Furthermore, these images also served as the basis for display materials assembled by Belgrand for exhibits within the pavilion of the City of Paris at the universal exposition in Vienna in 1873 and again in Paris in 1878. Yet, Nadar's photographs do not illustrate *Les Travaux souterrains de Paris*. Rather, the sewers are depicted with engravings that Belgrand commissioned from the Avril Frères in November 1863, over a year before Nadar ever carried his camera equipment into the sewers. Instead, the photographs included in the publication are derived from Belgrand's commission of Collard--who had made his name as the official photographer of the Service des Ponts et Chaussées--to photograph the channeling of spring waters into Paris, which Belgrand sourced from the Dhuis river in the mid-1860s and the Vanne river from fall 1869 through the end of the summer of 1870.[12]

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[11] The bulk of documentation assembled by Belgrand in his role as the director of the Service des Eaux et des Égouts went up in flames when his office in the Hôtel de Ville was burned in the period of the Paris Commune in May 1871. After this substantial loss, which included more than twenty-six handwritten notebooks in which Belgrand had recorded the details of his work day-by-day, the engineer still managed to recreate the history of his work for the publication. Thus, while the publication tells the story of the city's waterworks as a completed one, it also raises the question of whether the publication itself operates as document, as Belgrand would have it, or as a carefully crafted interpretation and interpolation of documentation, photographic or otherwise. On the loss of documentation in 1871, see, Lalanne, *Notice sur la vie et les travaux de E. Belgrand*, 18.

[12] Collard's photographs of the aqueducts are discussed in McCauley, *Industrial Madness*, 216-217; and in Le Mée, "Collard, photographe des Ponts et Chaussées," 42. In addition to Collard's photographs reproduced in *Les Travaux souterrains de Paris*, paper prints exist in archival collections. His photographs of water sourcing of the Vanne river are collected into thirty-one unbound photographs, which are mounted on board. Reproductions are held at the archives of the École des Ponts et Chaussées as well as at the Archives de Paris.

Instead of lingering in the murky galleries beneath the urban floor, this chapter will deal with Collard's photographs for the diversion of spring water into the metropolis reproduced in *Les Travaux souterrains de Paris*. If Nadar visualized the extension of the capital's new underground spaces that resulted from modernization, Collard's photographs of the Dhuis and Vanne rivers illustrate the expansion of the city's physical contours into the countryside. While both photographers propelled these spaces into the visual landscape of the modern metropolis, Collard's photographs held particular political agency as they made the more distant lands of the countryside visible and knowable to Parisians. As Collard transported his camera equipment to the countryside and pointed his lens towards Belgrand's work, his images became entangled in the municipal government's extraordinary quest to source of potable spring water for the city.

The municipal government's efforts began in the early 1850s when it first sought to scout out new water sources for the consumption of its burgeoning population. Before the Second Empire, the city's water supply primarily derived from the Seine and from the canal of the Ourcq, the latter a project of the Napoleonic Empire.[13] Supervised by the engineer Pierre-Simon Girard, the canal diverted the Ourcq River, a tributary of the Marne whose headwaters come from Fère-en-Tardenois in the department of Aise in Picardy. Its waters flow into Paris from the north at the basin of la Villette and descend into the city center along the Canal Saint-Martin.

In 1854, Haussmann drew Belgrand into the overhaul of the municipal administration and named him the director of the Service des Eaux et des Égouts.[14] At this time, Belgrand undertook

[13] While the city's principal water supply derived from the canal of the Ourcq and the Seine, smaller sources included the waters of the aqueduct of Arcueil, the groundwater of Grenelle, and sources from the north including Belleville and Prés Saint-Gervais. Eugène Belgrand, *Historique de service des eaux, depuis l'année 1854 jusqu'à l'année 1874* (Paris: Dunod, 1875), 1-2.

[14] Indeed, Haussmann claimed to have conceived of the need for improved water sourcing and distribution as part of his notion of the city as a series of comprehensive and interconnected networks for urban circulation. Georges-Eugène Haussmann, *Mémoires du Baron Haussmann*, vol. 3 (Paris, Victor-Havard, 1893), 261. Ideas for a systematic water distribution system developed among hygienic reformers and Saint-Simonians during the 1830s.

exhaustive preliminary studies of new sources for potable water to bring into the metropolis. The city's existing water supply depended substantially on rainfall, a precarious and often unreliable source. Moreover, the water supply was saturated with mineral deposits that left it hard and often contaminated. As part of his study, Belgrand surmised that the existing water supply would suffice for public purposes including street cleaning and park irrigation, but not for private consumption. To develop a second water supply for drinking, Belgrand searched out alternative sources of spring water, which were located at higher altitudes than Paris so that the water would flow into the city along gravity-operated aqueducts running below and above ground level. He first identified the Dhuis in Champagne to divert and bring into the city at the colossal reservoir built in Ménilmontant in northeastern Paris. While Belgrand's pilot studies for the project began in 1854, the final decision to begin the project's construction was decreed in March 1862 and the work was brought to completion only in 1865. With the annexation of the eleven surrounding *faubourgs* into the capital in 1860, the water of the Dhuis proved to be insufficient for the city's growing population before construction ever began on the project. Belgrand therefore decided that the Dhuis's water would serve northern Paris including the neighborhoods of Belleville, Montrouge, and Montmartre. In the interim, Belgrand looked for another water source to distribute to the city's center and he identified the spring waters of the Vanne, a tributary of the

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Most prominently, these critics associated Paris's water supply with the concerns over sanitary conditions that erupted in the face of the cholera epidemic that swept through the capital in 1832, see Papayanis, *Planning Before Haussmann*, 152-165. Writing in the Saint-Simonian journal *Le Globe*, Flachat identified the city's water as the first and surest preventative measure against the epidemic, which was then associated with miasmic disease theory. In fact, Flachat envisioned a systematic water distribution system: "L'exécution de ce projet permettrait aussi de doter la ville d'un système général d'égouts. La pose des tuyaux conducteurs de l'eau à distribuer nécessite dans toutes les rues des travaux de terrassement qu'il est tout naturel et très-économique de combiner avec les travaux et les terrassements nécessaires pour l'établissement des égouts. Cette seconde entreprise est d'ailleurs la conséquence immédiate de la première. Jeter à la surface de la ville une grande abondance d'eau fraîche et pure pour tous les besoins de l'hygiène et de la consommation, et, immédiatement après l'usage, absorber cette eau dans des voies souterraines qui l'entraînent hors de l'influence si rapidement désorganisatrice de la chaleur et de l'atmosphère; tel doit être, pour être complet, le système de distribution d'eau dans une ville." Flachat, "Le Choléra--Assainissement de Paris," 45.

Yonne originating in Bourgogne, as such a source. The decree to begin the project was made in December 1866 and the project drew to completion in 1874 after the fall of the Second Empire.

Collard's photographs of the Dhuis and the Vanne narrate the sourcing of fresh water from their very origin in the countryside and trace their courses into Paris. Not only were the projects funded by the city of Paris, but the municipal government also purchased the land upon which the new aqueducts flowed. These projects thus created nationally integrated waterworks that transformed part of the French countryside into productive resources in service of the production of the modern capital. While Collard adopted visual tropes of repetition and seriality associated with modern industrial culture in his photographs for the bridge campaigns commissioned by the Service des Ponts et Chausseées, his photographs of the Dhuis and the Vanne show remarkable heterogeneity in comparison. As Collard was dispatched to the French countryside, he captured Arcadian images that reproduce the state's economic and industrial transformation of the landscape as part of the modern metropolis's visual culture.

From New York City's venture to obtain water from the Croton River in Westchester County in the 1830s to Los Angeles's acquisition of water from Owens Lake in the Sierra Nevada at the beginning of the twentieth century, the attempts of modern cities to procure water from distant sources have historically erupted in fiery disputes.[15] The case of Paris was no different. Cultural anxieties stirred over the novel idea of drinking spring water instead of local river water. Furthermore, rural populations, who inhabited the lands upon which the proposed aqueducts would run, vocally resisted the projects. It is my purpose in this chapter to show that Collard's pastoral photographs of the sourcing of water functioned to naturalize these

[15] Comparisons between these project are beyond the scope of my study. On New York's efforts, see Matthew Gandy, *Concrete and Clay: Reworking Nature in New York* (Cambridge: MIT Press, 2003), 30. On the case of Los Angeles, see John Walton, *Western Time and Water Wars: State, Culture, and Rebellion in California* (Berkeley: University of California Press, 1993).

contentions.[16] I will first consider Belgrand's conception of photography as an objective medium in order to understand how photography gained the authority to undercut these debates. Next, I will analyze Collard's photographs within the context of public discussions that pitted official desires against the apprehension of local and rural populations. Instead of providing a comprehensive account of the photographs in Belgrand's publication, I will treat images that reflect major narrative threads that the engineer engaged to neutralize the social and political implications of the water sourcing projects. Ultimately, I will show that Collard's images fed an enormous official publicity machine. And this image-saturated narrative helped to temper the debates over Second Empire hydraulic engineering. Through their reproduction in *Les Travaux souterrains de Paris* and their circulation at universal expositions, Collard's photographs diffused the disputes that rocked the municipal government's quest to source potable water by fashioning the countryside as a cultural landscape imagined through potent, universal claims made on science, technology, and nature. As a result, his photographs constituted another means by which municipal engineers mobilized photography in the name of the construction of modern Paris.

[16] I adopt the concept of naturalization from Harvey, who has pointed out that "the idea of circulation" was at the core of Haussmann and Belgrand's project. For Harvey, this notion of circulation proffered a double metaphor in the Second Empire: "On the one hand, it could emphasize the cleaning functions of the free circulation of sunlight, of water, and of sewage in the construction of a healthy urban environment at the same time that it evoked a connection with the free circulation of money, people and commodities through the city, as if these were also entirely natural functions." Harvey, *Paris: Capital of Modernity*, 251. Harvey's emphasis on the ways in which this potent language contained the power to naturalize social and economic forces bears on Collard's images in particular and the visual culture of Belgrand's publication more broadly. Certainly, we should assume that there was a particular logic behind Belgrand's decision to illustrate his magnum opus primarily with Collard's pastoral photographs, an issue taken up below.

Fieldwork

On a plateau at the base of the great chalky summit of Coquibu in Fontainebleau, groups of engineers are gathered together: some stand beneath a pitched-roof tent while others pose alongside a surveying instrument set on a tripod. In Collard's panoramic photograph of the scene executed on 16 December 1869 (Fig. 3.2), the rolling terrain of silt, sand, and grass envelops and, indeed, dwarfs the figures. As the engineers face the looming mountain, the summit confronts them with the Herculean feat at hand, which is registered by another group of workers standing on the top of the hill who have begun plumbing deep into its strata. The figures that boldly populate this otherworldly, seemingly infinite topography are in the midst of undertaking the arduous task of building the foundations for the aqueduct the Vanne, which they will submerge beneath the siliceous sands of Fontainebleau that compose the hill. This scene that pits men against nature, indelibly transforming *terroir* into territory, pictures the conquest of the French landscape in the name of the geopolitical expansion of the modern city and its unrelenting thirst for spring water to quench its growing populace. Exploiting visual tropes of human ingenuity and perseverance that are so heroic and universal, the photograph naturalizes this social and political quest as if the municipal government's incorporation of distant lands into the metropolis were a part of the capital's natural destiny.

Laying the foundations for the aqueduct of the Vanne beneath the Fontainebleau sands--as it ran northward from its source in Bourgogne to the south of Paris before arriving at Montsouris--was one of the most challenging tasks faced by Belgrand in this colossal operation.[17] Collard's photograph of this event, which Belgrand reproduced in his *Les Travaux*

[17] On the difficulty of this work, see Belgrand, *Les Travaux souterrains de Paris*, vol. 4, 217-220.

souterrains de Paris, operates as part of a major narrative thread in the publication that visually maps the countryside in order to portray a carefully constructed representation of the modern city. In Collard's photographs of the diversion of water of the Dhuis and the Vanne, the photographer would rely upon scenes of sublime encounters with natural phenomena, industrial transformation, and picturesque pastoral life to formulate this urban representation of the lands acquired by the municipal government as a resource for the capital. Collard's documentation of Belgrand's multifaceted work in the sands of Fontainebleau helped establish a particular ground for understanding the engineer's use of photography as a means to champion heroic conceptions of the immense undertaking.

In addition to travelling through the countryside to photograph the aqueduct of the Vanne, Collard's documentation of the vast enterprise also includes two studio photographs executed in 1870 (Figs. 3.3 & 3.4). The photographs illustrate individual rock fragments disinterred from the sandstone boulder fields of Fontainebleau, natural landforms which stand among the region's precious sands and which were part of Belgrand's stratigraphic study for sourcing spring water. When touring the progress of the Vanne aqueduct on 27 March 1870, over three months after Collard captured the image of the nearby summit of Coquibu, Belgrand was struck by the striations of the tightly cemented sandstone plateau in La Padole, not far from Corbeil.[18] Captivated by the appearance of the sandstone's depressions, Belgrand returned to the site on 13 April with members of the Société Géologique to further inspect their arresting qualities. After arriving at the railroad station at Corbeil, Belgrand led his colleagues on a short detour before returning to La Padole to visit an ancient plateau of the Seine. The plateau, which then rose about 30 meters above the river, dates from the Quaternary period when the region was submerged in

[18] The following account of Belgrand's site visits comes from Eugène Belgrand, "Note sur la présence de stries à la surface d'une table de grès de Fontainebleau dans la localité dite la Padole," *Bulletin de la société géologique* 27, no. 2 (1869-1870): 549-557.

the water that eventually came to form the Seine. Once standing on the plateau, Belgrand gestured to the great mounds of sand, "reminders of destroyed terrain" as he later called them, and noted their shared alignment with the general direction of the currents that eroded the valley and formed the basin of the Seine in distant times, running from southeast to northwest.[19] Asking his guests to bear this point in mind, Belgrand guided the group toward the chalky mound of La Padole covered by a monolithic lens of sandstone no less than 5 to 6 meters thick and 100 meters across.

Beneath their feet, the men observed two principal variations in the ridges on the sandstone, which are each illustrated in Collard's photographs. First, part of the stone contained spiral striations, which were notable because the pattern permeated through the entirety of the stone. The men agreed that these spiral marks were part of the natural disposition of the rock. Other portions of the sandstone, however, contained remarkably parallel, rectilinear ridges, which, unlike the deep spiral depressions, only ran upon the stone's surface. It was these latter ridges that particularly intrigued Belgrand and his audience, and it was the curious direction of their parallel grooves that spurred the engineer to organize the site visit. Belgrand's colleagues pulled out their compasses, and found that the ridges ran from southwest to northeast, a direction different from that of the rest of the region as he had noted in the earlier part of the tour. Belgrand surmised that the unique direction of the ridges on the sandstone was the result of the passage of a hard force under extreme pressure that predated the baring of the rest of the plateau in the Quaternary period. The direction of these marks thus evidenced that northern France had undergone not one, but two distinct diluvial cataclysms. Belgrand dated these ridges to a first

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[19] Belgrand, "Note sur la présence de stries à la surface d'une table de grès de Fontainebleau dans la localité dite la Padole," 551.

diluvial wave of glaciers that passed over the region at the end of the Tertiary period as the earth's climate began to warm, causing glacial drift. As ice scraped against stone, it left its indelible imprint in the form of the striations on the surface of sandstone.[20]

Under Belgrand's direction, quarry workers detached specimens of the sandstone of 40 to 50 centimeters in width, which Belgrand subsequently kept in his office at the Hôtel de Ville.[21] Collard must have photographed the two sandstone fragments in the summer of 1870 before the Prussian siege and before they were destroyed when Belgrand's office went up in flames during the Paris Commune in May 1871.[22] Indeed, Collard also photographed the excavated medals from the foundations of the Pont Saint-Michel in Paris as part of institutional regimes of historic memory. Here, the photographer captured the visual traces of the rock along which the springs of the Vanne flowed, connecting the documentation of the water-sourcing project with Belgrand's geological studies and the natural disposition of the site. In the photographs, the rough, striated stones are propped up on a ledge swathed in black drapery as their ashen bodies come into sharp focus against a dark background. As the second specimen, which contained the parallel ridges, was the evidentiary linchpin in Belgrand's claim that the basin of the Seine dated back further in history than previously imagined, it is no wonder that he chose to reproduce this photograph in *Les Travaux souterrains de Paris* (Fig. 3.5). Blown up across a double-page spread in the body

[20] Belgrand believed that it was the rapid and sudden deluge that formed the elevation of the Alps that first swept through northern France. Following the theory of Elie de Beaumont, Belgrand speculated that the sudden melting of snow on that same great range caused a second diluvial wave to pass over the region. Belgrand, *La Seine. Le bassin parisien aux âges antéhistoriques*, vol. 1. Second Edition (Paris: Imprimerie Nationale, 1883), LI and XXXIX.While it is beyond the scope of the present study, it is worth pointing out that Belgrand's deductions were part of a lively geological debate in which a variety of conclusions were argued. See, for example, J.P. "La Seine," *Nature* (14 March 1872): 377-380.

[21] E. Collomb, "Note sur des stries observée sur les grès de Fontainebleau à la Padole et à Champeuil (Seine-et-Marne)," *Bulletin de la société géologique* 27, no. 2 (1869-1870): 558

[22] The destruction of the rock samples in the fire of the Hôtel de Ville is mentioned in Belgrand, *Les Travaux souterrains*, vol. 4, 221; and Charles Kleitz, *Exposition universelle de Vienne en 1873. Section française. Rapport sur les travaux du génie civil* (Paris: Impimerie Nationale, 1875), 61.

of the book, the reproduced image differs from Collard's photograph. Closely cropped, the surface of the stone now absorbs and spreads across the surface of the page, transforming the striations made by glacial movement into the primary object of visual inquiry.

As part of his work for the Service des Eaux et des Égouts, Belgrand undertook exhaustive studies of the basin of the Seine, and he recorded geological and archaeological information discovered during the construction of his projects associated with the sourcing of spring water. In the face of the sizeable research component of Belgrand's undertaking, his interest in the sandstone of La Padole is neither surprising nor unique. In fact, his analysis of the stone became part of his larger geological history of the region that he compiled for his publication, *La Seine. Le Bassin parisien aux âges antéhistorique*. The book was first published in 1869, and his discovery at La Padole was only integrated into the second edition of the book, released in 1883 after his death, which incorporated material related to the "*antéparisien*" topography of the basin of the Seine that was also included in *Les Travaux souterrains de Paris*.

Turning back to the first edition of *La Seine*, we nevertheless find a curious photographic enterprise that sheds light on Belgrand's attitudes about the medium more broadly. The 1869 edition of the publication includes a sumptuously illustrated atlas comprised of photographic plates reproduced by means of photogravure, the earliest, and costly, means of photographic reproduction based on intaglio printing.[23] Rather than illustrating geological specimens in the album, however, Belgrand reproduced an exhaustive inventory of mammal fossils found in the basin of the Seine, which he regrouped from preexisting collections and arranged chronologically and geographically in the atlas. Turning to paleontology, Belgrand organized and classified the mammalian fauna of Paris's Quaternary period "when our country was

[23] On photogravure, which in French is specifically héliogravure, see Luis Nadeau, "Photogravure," in *Encyclopedia of Nineteenth-Century Photography*, ed. John Hannavy (New York: Routledge, 2008), 1112-1114.

crisscrossed by immense watercourses... [that] ended with great courses of water… when their beds had been filled with either gravel and silt, or with peat, that had created our small modern rivers and the stone age."[24] The disembodied, fossilized bones published in the atlas--ranging from the heads of aurochs found at Montreuil-sous-Paris and the molars of an elephant recovered from Avenue Daumesnil to a human skull from the Avenue de Clichy--are transformed through photographic reproduction into flattened fragments (Fig. 3.6). Not only an encyclopedic portfolio of indigenous prehistoric mammals, these ossified specimens operated as paleontological evidence of geological phenomena. Thus, the presence of a hippopotamus revealed the former existence of larger and fuller rivers in the basin of the Seine, while the appearance of reindeers, musk oxen, and marmots indicated low winter temperatures and thus evidenced northern France's glaciation.

For Belgrand, the photographic reproduction of these ossified bones operated as a form of visual proof. Writing about the application of the medium in the publication, he noted that the paleontological plates were created with "a special process of photolithography excluding all personal interpretation on the part of the draftsman, and consequently guaranteeing the scientific precision of the representation."[25] Indeed, the young medium's ability to faithfully reproduce some of nature's earliest objects was one of the initial claims made by photography's formative protagonists. Consider Daguerre's *Arrangement of Fossil Shells* (Fig. 3.7), a daguerreotype of the late 1830s, in which the photographer illustrates a cramped collection of fossils arranged on

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[24] "L'époque quaternaire a fini avec ces grands cours d'eau, et c'est lorsque leurs lits ont été comblés soit avec du gravier et du limon, soit avec de la tourbe, qu'ont commence nos petites rivières modernes et l'âge de la pierre polie." Belgrand, *La Seine*, vol. 1, 3

[25] The reproductions were made thanks to "un procédé spécial de photolithographie excluant toute interprétation personnelle de la part du dessinateur, et garantissant, par conséquent, l'exactitude scientifique de la figuration." Belgrand, *La Seine*, vol. 2, 5.

three shelves. The system of classification visualized in the still life was not unique to early photography, but it participated in then salient debates within natural history over, as Carol Armstrong writes, "the extent to which a comparison of the fossil record with skeletons of modern species suggested continuity or rupture, progressive evolution or catastrophic extinction." Certainly, the famous debates among naturalists that flared over evolution within the halls of the Jardin des Plantes seemed to become embodied, and even ossified, in the daguerreotype's "metallic petrification."[26]

As fossils escaped from the deep surface of the daguerreotype and emerged as flat images on the photograph's paper ground, the medium did not loose its privileged position as a vehicle for objective representation. In fact, Belgrand's conception of photography's "scientific precision" participated in then current and widely held scientific attitudes about the medium. These beliefs are based on the logic of what Lorraine Daston and Peter Galison have termed "mechanical objectivity" with its "insistent drive to repress the willful intervention of the artist-author, and to put in its stead a set of procedures that would, as it were, move nature to the page through a strict protocol, if not automatically."[27] Within the context of Belgrand's scientific writing, his photographic applications formalize visual links that unite the "ingenious synthesis" of the astonishing variety of scientific modalities that Belgrand brought to bear on hydraulic engineering.[28] Yet, as Daston and Galison underscore in their discussion of scientific atlases in general, these images were scarcely neutral; rather, their capacity to "shift attention to the reproduction of individual items" to visualize the significance of the discrete object reveals these

[26] Carol Armstrong, "Cameraless: From Natural Illustrations and Nature Prints to Manual and Photogenic Drawings and other Botanographs," in *Ocean Flowers: Impressions from Nature*, ed. Carol Armstrong and Catherine de Zegher (New Haven: Yale Center for British Art, 2004), 97.

[27] Daston and Galison, *Objectivity*, 121.

[28] Lalanne, *Notice sur la vie et les travaux de E. Belgrand*, 16.

photographs as "images at work," representations that contain an operative, even ideological, facility.[29] To what degree this epistemic framing of sandstone fragments and mammal fossils conditioned meaning in Belgrand's oeuvre raises many questions when we recall that Belgrand was not merely a gentleman naturalist for whom scientific study was a discrete, intellectual pursuit of knowledge. Rather, as an engineer, Belgrand's research operated in service of applied, not pure, science.

The tracking of geological time, the unearthing of geological strata, the laying bare of its petrified contents that shoot through Belgrand's use of photography, along with his research more broadly, bind his work to the municipal government's systematic investigation and minute chronicling of the materials, albeit organic ones in this instance, that surfaced in the wake of urban modernization. Furthermore, Belgrand's study of Paris's water supply within this *longue durée* stretches back to remote periods that transcend human experience as part of what geologists call "deep time," the timescale that chronicles prehuman history.[30] Yet, his emphasis on this ostensibly infinite history circumvents the vicissitudes of social reality through its tenacious emphasis on the immutable, slow progress of natural phenomena as the groundwork for understanding the sourcing and distribution of water. In fact, Belgrand's study of this geological ground contained both natural and social ramification. And to understand the signification of photographs illustrating parallel streaks upon stone, petrified bones, or the labors involved in submerging the aqueduct's foundations below the sands of Fontainebleau, we must

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[29] Daston and Galison, *Objectivity*, 121. On what these authors term "working objects," of which scientific atlas images are but one example, 19-27.

[30] Martin Rudwick, *Bursting the Limits of Time: The Reconstruction of Geohistory in the Age of Revolution* (Chicago: University of Chicago Press, 2005), 2.

recall that these images were also entangled in official efforts to promote the geological makeup of the ground from which water was sourced.

Collard's photographs illustrating Belgrand's work in the sands of Fontainebleau contributed to the engineer's quest to establish objective and scientific notions about the projects within the pages of *Les Travaux souterrains de Paris*. Although this constellation of images that pulls geological and paleontological inquiry into the same orbit as construction photographs highlights the expanded domain of hydraulic engineering, this compellation of images also evidences photography's ideological valences. Once these photographs were reproduced in Belgrand's publication, they offered a visual scaffold for conceptualizing the hydraulic engineering projects. Indeed, this official framing of the undertaking differs significantly from the fractious disputes that raged around the question of tapping spring water in the Second Empire. Here is an instance of where design becomes the "political battlefield" discussed by Steven Lubar: "a place where social relations are hidden in new technologies under the guise of 'science' and 'rationality.'"[31] Certainly, Belgrand's own attitudes about photography emphasize its objective factuality. Nevertheless, we should take a certain amount of critical distance from Belgrand's claims in order to probe the social and political implications of Collard's photographs. To begin such an undertaking, it is worth considering Collard's images of the Dhuis as they cast the ideological charge of Belgrand's use of photography in sharp relief.

[31] Steven Lubar, "Representation and Power," *Technology and Culture* 36, no. 3 (April 1995): 59. On the political implications of technological artifacts, see also Langdon Winner, *The Whale and the Reactor: A Search for the Limits in an Age of High Technology* (Chicago: University of Chicago Press, 1988), 19-39.

Water Wars

Collard's photographs of Belgrand's work for the diversion of the Dhuis's water undertaken in the mid-1860s employ sentimental, picturesque visual tropes. In photographs of the headwaters of the Dhuis, which are illustrated in the pages of Belgrand's publication, engineers hover over small pools of water surrounded by bucolic wilderness in images that occlude the industrialization of the countryside launched by the project (Fig. 3.8). Even Collard's photographs that illustrate the physical transformation of the landscape exploit similar rustic aesthetics. Take his photograph of the work in a trench at the entrance of Bois de Dames near the source of the Dhuis's groundwater in Ardennes (Fig. 3.9). The image captures the enormous trench in perspectival recession, which appears deepened by the excavated earth and stones piled on either side of the cavity. Engineers and workers hover over the periphery of the rectangular ditch above grade, while other workers furrow into the earthwork below to lay water pipes. The trench itself is held open by a framework comprised of irregular and ragged pieces of timber that share none of the uniform precision of the falsework frames mobilized for bridge building in the capital. Instead, the organic materials that hold open the trench appear as if they were harvested from the local site and camouflage the industrial transformation of land then underway. Within a horizontal landscape shaded by trees, the "machine in the garden," to borrow Leo Marx's influential metaphor for understanding the struggle between "the pastoral ideal" and technological development, appears as a trite intervention in the wilderness.[32]

In seeking a language to visualize the diversion of the Dhuis river, which largely ran underground from a source near Ardennes in Champagne to Paris, Belgrand's work, along with

[32] Leo Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America*. Fifth Edition (New York: Oxford University Press, 2000).

Collard's photographs of it, adopts sentimental attitudes toward nature. Collard's insertion of images of the unbridled landscapes within a series of photographs illustrating the industrial transformation of the countryside was hardly novel. In Baldus's album of the Chemin de Fer du Nord of 1855, which was commissioned by Baron James de Rothschild and offered to Queen Victoria, he interlaced photographs of train stations and rails with images of the unbridled nature discovered along the train's route.[33] Moreover, in crafting this language to illustrate the metropolis's voyage into the countryside, the water sourcing campaigns mirror what would have been familiar visual tropes for representing nature in the Second Empire. In his work as the director of the Service des Promenades et Plantations, Alphand developed extensive picturesque parks in the capital, which had given a certain currency to bucolic aesthetics.[34] It is hardly surprising that Belgrand would adopt aesthetic practices similar to those of his colleague when developing a visual language for representing the capital's geopolitical expansion. By doing so, Belgrand's campaigns arrested the countryside into an artificial conception of nature. Furthermore, Collard's photographs of his work formalized and reproduced an urban imaginary of the landscape in the form of a representation.

This aestheticizing of nature, which resulted in Collard's images that fetishized rusticity, holds additional implications. In fact, Collard's photographs helped to substantiate Belgrand's claims on the purity of spring water. Because bedrock leaves chemical deposits, the geological composition of the earth from which water is sourced carries far-reaching, and often dire, implications. Therefore, questions concerning water's contamination from trace minerals (among other sources) were at the very heart of the municipal government's quest to source potable

[33] Daniel, "Édouard Baldus, *artiste photographe*," in *The Photographs of Édouard Baldus*, 45.

[34] Green, *The Spectacle of Nature: Landscape and Bourgeois Culture in Nineteenth-Century France*.

water. At the beginning of his publication, Belgrand wrote about his intentions behind sourcing spring water: "The water diverted to Paris was… to be *limpid, fresh, and neither contain solutions of calcium sulfate nor magnesium sulfate, nor even a volume of carbonate sulfate large enough to create incrustation*."[35] Here, Belgrand addressed dissatisfaction with the composition of the city's old water supply. In enumerating its contaminants, the engineer explained that the waters of the Seine and the Ourqc (the city's principal water sources before the Second Empire) were hard, producing notoriously foul odors and noxious tastes. In the case of the water from the Seine, the ground around Paris contains too much gypsum, depositing substantial traces of calcium sulfates, which, along with the residue of industrial waste from within the city, created undesirable qualities in its waters. Even Haussmann exclaimed that the waters of the Seine "do not cook vegetables and do not dissolve soap."[36] The waters of the Ourcq also contained sulfates; furthermore, aquatic plants grew freely along the marshy banks of the river, which left too much peat and made the water even more unpleasant. Lastly, Belgrand stressed additional contaminants in the waters of the Ourcq: namely the fecal matter left by the bargemen and boatmen who lived along the canal at the basin of la Villette.[37]

In contrast with Belgrand's compulsory list of the contaminants of Paris's water supply, Collard's photographs of the diversion of the Dhuis's water evidence the countryside as a bucolic landscape to highlight the uncontaminated, pure composition of the water being sourced. Yet, for all of their chaste, rural aesthetics, these images were also animated by a political urgency that derived from heated debates over the sourcing of spring water in the late 1850s. Writing about

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[35] "L'eau à dériver à Paris devait, suivant moi, être : *limpide, fraiche, et ne contenir en dissolution ni sulfate de chaux, ni sels de magnésie, ni même un volume de carbonate de chaux assez grand pour la rendre incrustante.*" Italics are Belgrand's. Belgrand, *Les Travaux souterrains de Paris*, vol. 4, 5.

[36] The waters around Paris "donnent une eau dure, malsaine, ou tout au moins d'une digestion pénible, qui ne cuit pas les légumes et ne dissout pas le savon." Haussmann, *Mémoires du Baron Haussmann*, vol. 3, 342.

[37] Belgrand, *Les Travaux souterrains de Paris*, vol. 4, 5.

Paris's water supply in the daily newspaper *Le Temps* in 1861, the journalist Frédéric Lock cut to the chase in the matter: "Unfortunately, the domain of science is no less open to disputes and contradictions than… [the domain] of politics."[38] *Le Temps* published these words scarcely three months before the Second Empire government finally passed the decree that permitted work to commence on the diversion of the Dhuis in March 1862. In the years since Belgrand had undertaken his pilot studies for sourcing spring water for the capital beginning in 1854, contentious debates over the city's pursuit of spring water subsequently erupted at the end of this decade. As Jean Gay explains, Belgrand's proposal prompted two heavily contested and seismic questions that defined the terms of these disputes.[39] First, was spring water necessarily a better option for drinking than the river water of the Seine? And, what were the consequences and costs of the procuring water, not for Parisians, but for the people who inhabited the land upon which the new aqueducts would flow?

In his *Mémoires*, Haussmann recalled the gravity of the first question that substantially delayed progress on the diversion of the Dhuis's water in the late 1850s. The debate fomented what Haussmann called a "Homeric struggle" as he wrestled with the city's Municipal Council over complaints voiced by "the fanatics of the water of the Seine" who sought to continue to exploit the river as the main source of the city's drinking water.[40] Criticism of the Seine's water stretched back long before Belgrand ever undertook his studies. In his *Tableaux de Paris*

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[38] "Malheureusement, le domaine de la science n'est pas moins que celui de la politique livre aux disputes et aux contradictions." Frédéric Lock, "Eaux de Paris," *Le Temps*, 1 December 1861: 1.

[39] Gay, *L'Amélioration de l'existence à Paris*, 34.

[40] "Alors commença la lute homérique à laquelle on a peine à croire maintenant, mais j'eus à soutenir contre les fanatiques de l'eau de Seine, avant d'obtenir la déclaration d'utile publique." Haussmann, *Mémoires du Baron Haussmann*, vol. 3, 117. In the Second Empire, the thirty-six members of the Municipal Council of Paris were named by the emperor and held their positions for five years each. The council's power was notoriously feeble in the period, deferring to the interests of the Prefect and the Emperor. Nobuhito Nagat, *Les conseillers municipaux de Paris sous la Troisième République, 1871-1914* (Paris: Publications de la Sorbonne, 2002), 23-24.

published from 1781-1788, Mercier condemned the use of its water for human consumption: "When the river is muddy, we drink the muddy water: we don't know what we swallow, but we always drink it."[41] Pierre Beaumarchais put the same complaint in coarser terms, remarking that the inhabitants of Paris "drink in the evening what they piss out in the morning."[42] Yet, many Parisians in the 1850s remained content with drinking the river's water as their ancestors had done for centuries.

Partisans of drinking local river water launched two principal arguments against the aqueducts. First, they adopted an economic justification, contending that the projects were simply too expensive when compared to the lesser costs of exploiting local river water.[43] Furthermore, they pointed to issues concerning the local pollution of the Seine's water. Lock detailed this latter argument in his article in *Le Temps*, arguing that before the Seine entered Paris, its water was "in an excellent condition of purity and natural salubrity, potable, agreeable to drink and clean for domestic and industrial uses." Just before penetrating the city, the journalist noted, "the river receives the waters of the Marne, which cloud its clarity and augment its proportion of salt." Underscoring the focal point of his argument, Lock explained that the Seine became especially polluted once it passed through the city where factories dumped

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[41] "Quand la rivière est trouble, on boit de l'eau trouble : on ne sait trop ce qu'on avale ; mais on boit toujours. L'eau de la Seine relâche l'estomac pour quiconque n'y est pas accoutumé. Les étrangers ne manquent Presque jamais l'incommodité d'une petite diarrhée ; mais ils l'éviteraient, s'ils avaient la précaution de mettre une cuillerée de bon vinaigre blanc dans chaque chopine d'eau." Stéphane Robinet, *Eaux de Paris. Lettre à un conseiller d'état. Pour server de réponse aux adversaires des projets de la ville de Paris* (Paris: Bouchard-Huzard, 1862), 44.

[42] "Le mot de Beaumarchais sur les habitants de Paris, qui boivent le soir ce qu'ils vide le matin, est toujours vrai, quoique certains égouts aillent se déverser aujourd'hui à l'aval de Paris, au delà d'Asniers." Robinet, *Eaux de Paris. Lettre à un conseiller d'état*, 43.

[43] Jean Gay, *L'Amélioration de l'existence à Paris*, 42.

industrial waste into the river.[44] As Locke and other commentators noted, much of the river's pollution was in fact a recent phenomenon caused by the city's booming industry and expanded population.[45] These facts were of little interest to Belgrand who, following official arguments on the river's role as a conduit for transportation dating back to the eighteenth century, maintained that the water of the Seine was not for drinking, but for navigation and industry.[46] Yet, those who sought to harness local drinking water unsuccessfully proposed reforming the causes of the river's pollution to improve its quality rather than looking elsewhere in France to source water.

The second controversy that rocked debates over drinking water in the late 1850s concerned the ramifications of the aqueduct for the people who lived on the land upon which the structure would flow. In order to divert water from the countryside into Paris, the municipal government was obligated to purchase the land upon which the project ran, including private property. In fact, Belgrand acquired the terrain of the Dhuis on behalf of the city of Paris in

[44] "Le conseil d'hygiène constate que la Seine arrive aux portes de Paris enceinte fortifiée, dans d'excellente conditions de pureté et de salubrité naturelles, potable, agréable à boire et propre aux usages domestiques et industriels. Avant de pénétrer dans Paris, le fleuve reçoit les eaux de La Marne, qui troublent sa limpidité et y augmentent la proportion des matières salines. La traversée de Paris y ajoute d'autres caisses d'impureté, dont la plus grave est jonction des eaux de la Bièvre, qui a lieu un peu au-dessus du pont d'Austerlitz ; au-delà de ce pont, l'influence de la Bièvre diminue ; cependant, elle est sensible encore jusqu'au pont de l'Alma ; cette petite rivière est une véritable source d'infection. Au-dessus de Chaillot, l'eau de la Seine n'est pas sensiblement altérée par les dérélictions qu'y jettent les usines de Grenelle, Suresons, Puteaux et Courbevoie. Au-dessus d'Asnières, l'égout collecteur viennent y répondre une masse tellement considérable de déjections infectes, que le fleuve en est profondément altéré et rendu éminemment insalubre sur la rive droite jusqu'à la prise de Saint-Ouen, et bien au-delà." Lock, "Eaux de Paris," 1.

[45] This point is also made by Charles Kleitz in his assessment of the display dedicated to the Service des Eaux et des Égouts at the pavilion of the Ville de Paris at the universal exposition in Vienna of 1872. "L'altération progressive des eaux de la Seine par les déjections de l'industrie et de la population décida l'Administration municipal à dériver un volume d'eau de sources suffisant pour subvenir à tous les besoins de la population." Kleitz, *Exposition universelle de Vienne en 1873*, 53. On the earlier history of these claims that predate the Second Empire, see Backouche, "From Parisian River to National Waterway: The Social Functions of the Seine, 1750-1850," 28.

[46] On this point, see Paul Jolly, "Hygiène Publique. Question des eaux de Paris," *L'Union Médicale* 11 (14 September 1861): 518.

1859.[47] Furthermore, to expropriate this land, the municipal government was required to obtain a decree of *utilité publique* to commence the project.

Local protest against the expropriation of land had plagued the municipal government's earliest attempts to source spring water in the Second Empire. As part of his initial proposal for sourcing potable water, Belgrand intended to divert the ground water of the Somme-Soude in the department of the Marne in Champagne into Paris. As Haussmann pointed out, a "veritable league" was formed in the region to combat the creation of any aqueduct. To the chagrin of Haussmann and Belgrand, the lawyer and conseiller général of the Marne, Auguste Mathieu, successfully lobbied to suppress the diversion of the Somme-Soude's water, a project that would have displaced enormous populations in the countryside. Haussmann claimed that the lands of the project in the department of the Marne to source "the waters of the Somme, Soude, Sourdon, Dhuis, and other small rivers… traverse countryside that is hardly productive and scarcely populated."[48] Yet, Haussmann grossly underplayed the impact that the project would have had on local communities. As Mathieu stressed, the project "is not, in reality, going to expropriate two or three hundred citizens."[49] In fact, the project would have uprooted fifty-four villages

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[47] For the Dhuis, Belgrand drafted an agreement with the assistance of the engineer Edmund Huet and the owner Brajon for the acquisition of five hectares including the mill and sources were paid 65,000 francs: at least three times the value of the building. A few months after, these private deeds were notarized. Belgrand, *Les Travaux souterrains de Paris*, vol. 4, 107.

[48] Haussmann called these lands "de prendre dans le département de la Marne les eaux de la Somme, de la Soude, du Sourdon, de la Dhuis et autres petites rivières qui traversent de campagnes peu productives et peu peuples." Haussmann is quoted in Auguste Mathieu, *L'Expropriation pour cause d'utilité publique et les eaux de la Somme-Soude, de la Dhuis, du Sourdon et du Surmelin* (Épernay: Noel-Bucart, 1862), 6.

[49] "Il ne s'agit pas, en réalité, d'exproprier deux ou trois cents citoyens de tout ou partie de leur propriété." Mathieu, *L'Expropriation pour cause d'utilité publique*, 25.

inhabited by 26,695 people.[50] Moreover, Mathieu argued that while spring water was a luxury for Parisians, it was a necessity for the local economy, which relied upon the water to power its mills and papermaking industry.

At the heart of Mathieu's argument against the project was a legal dispute surrounding the logic of *utilité publique*, the decree that allowed expropriation in the name of collective interests over individual ones. Indeed, expropriating land for the aqueduct would not have benefited the local population of the Marne. Yet, as Mathieu conceded, *utilité publique* operates on different geographic scales, including the local authority, the department, and the nation.[51] Nevertheless, Mathieu questioned if the diversion of the Somme-Soude's waters really benefited the nation as a whole. Instead, he argued that it was only for the profit of the city of Paris. And he contended that expropriating the lands of the Marne for the sake of the project was in fact a violent act of land "appropriation" undertaken under the aegis of the capital's economic and territorial expansion.[52]

Of course, Belgrand and Haussmann tried to suppress the vocal activists such as Mathieu. As Haussmann explained, Belgrand attempted to demonstrate on many occasions that the aqueduct would run underground and therefore would be innocuous.[53] Yet, this "blind resistance," as the Prefect called it, successfully lobbied against the project and resisted centralization by swaying the opinion of Napoleon III. To Haussmann's dismay, the Emperor returned from a stay at his military camp in the Marne--the Camp de Châlons--and posed the

[50] The third example, in which expropriation is authorized for sake of the general collectivity, includes Imperial roads, canals, railroads, telegraph lines, ports, and military installations. Mathieu based his statistics on a report undertaken by the engineer in chief of the Marne. Mathieu, *L'Expropriation pour cause d'utilité publique*, 8.

[51] Mathieu, *L'Expropriation pour cause d'utilité publique*, 30.

[52] Mathieu, *L'Expropriation pour cause d'utilité publique*, 15.

[53] Haussmann, *Mémoires du Baron Haussmann*, vol. 3, 181.

question: "Why do you grasp so at taking the springs of the these people, when, following the studies whose results you have shown me, there are other ones just as good elsewhere?"[54] Indeed, the municipal government subsequently abandoned its plans to divert water from the Somme-Soude and instead focused its efforts on acquiring the spring waters of the Dhuis in northern Champagne.

The municipal government thus began its project to obtain the water from this predominantly rural department, which lacked the financial influence of the Marne. Nevertheless, sharp criticism of the city's plans again flared. To quell the disputes, the municipal government opened a public inquiry into the diversion of the Dhuis's water by assembling a commission headed by the president of the Academy of Medicine, Stéphane Robinet--the irony of his name was not lost on contemporary commentators.[55] In the commission's report of 1862, Robinet demonstrated little impartiality as he sought to discredit any accusation fired against the project. The first and longest critique that Robinet assailed came from the Paris-based doctor Paul Jolly who launched a missile against the diversion of the Dhuis's water in a series of articles published in *L'Union Médicale* in fall 1861.[56]

Jolly's anxieties over the project were twofold. First, he held reservations about the safety of drinking spring water from Champagne, preferring the water of the Seine instead. Champenois by birth, Jolly was appalled and irate over the municipal government's proposal as it would

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[54] "Pourquoi tenez-vous tant à prendre les sources de ces gens, lorsque, d'après les études dont vous m'avez soumis les résultats, il y en a bien d'autres tout aussi bonnes ailleurs." Haussmann, *Mémoires du Baron Haussmann*, vol. 3, 381-382.

[55] Lock, "Eaux de Paris," 1.

[56] Notably, Robinet claims that Jolly's dissertation was not widely read: "Nous savons qu'elle est déjà presque oubliée; nous savons même qu'imprimée à part et offerte au public, au Palais-Royal, dans les boutiques où se débitent toutes sortes de marchandises littéraires, cette lettre ne se vend guère, ou même pas du tout." Robinet, *Eaux de Paris. Lettre à un conseiller d'état*, 6. However, Lock discusses Jolly's argument and states that Robinet's condemnation of it is overcritical. Lock, "Eaux de Paris," 1.

radically transform his birthplace. In his 105-page response, Robinet tore down Jolly's criticism piece by piece. An issue of contention was Jolly's claim that the spring waters of the Dhuis were responsible for high rates of disease in Champagne. Robinet swiftly disproved Jolly's hypotheses. After closing the book on the matter, he then ridiculed Jolly:

> If you persist in menacing us about goiters, tooth decay, and stomach cancer in the case in which we should have the audacity to drink the water of the Dhuis, we… predict that river water will give you… kidney stones, strangury, sciatica, and hernias![57]

Although the majority of Robinet's public rebuttal of Jolly concerns the doctor's bad science, the bulk of Jolly's dissertation was in fact concerned with the social and economic implications of the project on the industry of northern Champagne. Yet, these latter claims were curiously absent from Robinet's response.

Jolly recognized that the obliteration that had threatened the Somme-Soude would now envelop the agrarian landscape of northern Champagne as the municipal government would source its waters and, in the process, devastate "the prairies, the flours mills, the industrial factories, sawmills, [and] paper mills… which is to say all the means of existence of this country."[58] While detailing the cataclysmic destruction he thought would be unleashed by the expropriations involved with the municipal government's project, the doctor lamented:

> I ask myself if the Municipal Council of Paris really understands the seriousness of the execution of a measure of expropriation, which would, in effect, clear away an entire province of France, its agricultural and industrial resources, all its elements of life and of

[57] "Si vous persistez à nous menace du goitre, de la carie des dents et du cancer d'estomac pour le cas où nous aurions l'audace de boire les eaux de la Dhuis, nous, de par Hippocrate et Molière, nous vous prédisons que les eaux de rivière vous donneront la pierre, la gravelle, la stranguries, la sciatique et des hernies !" Robinet, *Eaux de Paris. Lettre à un conseiller d'état*, 62.

[58] "Ce qui fait que déjà elle a été au devant des difficultés d'expropriation, en acquérant par acte authentique, les eaux de la D'huis, en vue d'exécution du projet de dérivation, et il en sera même pour les eaux souterraines de la vallée de la Somme-Soude, dût-on acquérir, en même temps pour ses eaux souterraines, les prairies, les moulins à farines, les usines industrielles, les scieries, les papeteries, etc., c'est-à-dire tous les moyens d'existence de cette contrée," Jolly, "Hygiène Publique. Question des eaux de Paris," 539.

> prosperity, at the same time as its waters. Water, in effect, is the life a country, not only the life of the current generation, but also the life of centuries.[59]

Dispensing with his scientific argument, Robinet would now counter the doctor's claim according to the logic of the marketplace. First, Robinet posed the question: "Who will think that a region will have such a sad fate because we will *buy* a few sources from it that it sold voluntarily for some good hard cash?"[60] Following the same reasoning, Robinet turned to Jolly's list of sites that the aqueduct would supposedly ravage. First, he addressed the matter of disappearing flourmills: "We don't want to take things so seriously and write, as had been done in another brochure, *Where will we buy our Flour?*" Instead, Robinet posed the following questions:

> But we ask if neighboring mills will not be angry… to have to mill a little extra rye or barley, [and] tell the mill hand to take a little longer road than before to serve the region that does not have watermills? What had Paris done in the past? It had the mills of Montmartre. We take your water, Monsieur Jolly! Take our windmills.[61]

Robinet continued in this vein, rummaging through the faults of Jolly's argument to deflate his accusations. Robinet explained that the prairies will not go without water and that there are not that many sawmills and paper mills in this region of Champagne, but only one of each.[62]

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[59] "Je me demande si le conseil municipal de Paris a bien compris tout ce qu'il y a de grave dans l'exécution d'une mesure d'expropriation, qui aurait pour effet d'enlever à toute une province de la France, ses ressources agricoles et industrielles, tous ses éléments de vie et de prospérité, en même temps que ses eaux. L'eau, en effet, c'est la vie d'un pays, non seulement la vie de la génération actuelle, mais la vie des siècles." Jolly, "Hygiène Publique. Question des eaux de Paris," 539.

[60] "Qui croira qu'une contrée sera vouée à un si triste sort parce qu'on sera venu lui *acheter* quelques sources qu'elle a vendues volontairement à beaux derniers comptants?" Robinet, *Eaux de Paris. Lettre à un conseiller d'état*, 77.

[61] "Nous ne voulons pas prendre la chose au sérieux et nous écrier, comme on le fait dans une autre brochure: *Où irons-nous chercher des farines?* Mais nous dirons que les moulins voisins ne seront pas fâchés (n'étant pas achetés un bon prix) d'avoir à moudre un peu plis de seigle et d'orge, dissent les valets de meunier faire un peu plus de chemin qu'auparavant pour desservir le pays qui n'ont pas de moulins à eau? Comment faisait Paris dans le temps jadis? Il avait les moulins de Montmartre. Nous prendrons votre eau, Monsieur Jolly! Prenez nos moulins à vent." Robinet, *Eaux de Paris. Lettre à un conseiller d'état*, 79.

[62] Robinet, *Eaux de Paris. Lettre à un conseiller d'état*, 80.

Nevertheless, Jolly's discourse reveals the very real anxieties and trepidations engendered by the modern city and the power of its centralized administration that sought to colonize the countryside as part of the rescaling of the capital.

Underpinning the municipal government's exploitation of the countryside were derisive attitudes about the region of Champagne and its rural inhabitants that reflected long-standing stereotypes held by Parisians against the provinces. As Alain Corbin explains, "The notion of *la province*… depended… on the perception of a deficiency, an estrangement, a privation-- the absence of the capital."[63] The official discourse surrounding the diversion of the Dhuis's water was not only laced with blatant disregard for its inhabitants, but also with unconcealed arrogance and snobbery towards the rural Champenois, whom, as Jolly points out, "Belgrand takes so much pleasure in calling *flea-ridden*."[64] Such scornful attitudes carried two implications. First, this flagrant disdain suppressed the desires and values of the Champenois outright. Second, the city came to depend on their spring water and, while disparaging of the region, it inexorably transformed their land into an economic resource for the capital.

By the time Collard was dispatched to document the aqueduct of the Dhuis in the mid-1860s, the debates surrounding the project had largely been laid to rest as Belgrand was already completing his work on the project. Nevertheless, Collard's rustic aesthetics must be understood in light of these debates, which made the waters of the French countryside a topical issue. Furthermore, it would be difficult to take the seemingly innocent and sentimental outlook

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[63] Alain Corbin, "Paris-Province," in *Realms of Memory: Conflicts and Divisions*, vol. 1, ed. Pierre Nora, trans. Arthur Goldhammer (New York: Columbia University Press, 1996), 428. See also Weber, *Peasants into Frenchmen: The Modernization of Rural France, 1870-1914*.

[64] "Il faut bien aussi que la Commission sache que les goitreux de la Champagne ne sont pas des crétins: que cette Champagne que M. Belgrand prend tant de plaisir à appeler *pouilleuse*, bien qu'elle nourrisse la capital du produit des ses moissons laborieusement acquises, a aussi ses gloires militaires et littéraires." Jolly, "Hygiène Publique. Question des eaux de Paris," 540. Notably, Robinet does not counter this point.

towards nature illustrated in Collard's images at face value. Furthermore, it would be difficult to suggest that this photographer, who built a significant part of his firm's practice on successfully providing photographs to elite *fonctionnaires*, was ambivalent towards official desires in his pastoral images. In fact, in the months following his commission from Belgrand to document the aqueduct of the Vanne, Collard executed a commission on behalf of the Ministry of War during the Paris Commune of 1871. While forty other photographers were arrested and convicted for conspiring with the Communards, Collard gained official access to the capital during the revolution on 16 May 1871 with two assistants to photograph barricades, burned houses, and public monuments on behalf of the Thiers government.[65]

The reproduction of Collard's photographs in *Les Travaux souterrains de Paris*, which conflate the purity of the natural landscape with the purity of its spring waters, helped dissipate, and indeed supplant, the earlier debates of the project. In fact, these photographs reveal none of the political machinations involved with the city's efforts to source spring water since they do not depict the social upheavals that they spurred. Instead, the images proffered muted, naturalistic visions of the countryside, which conceptualized the projects as consumable images and reflected an urban representation of the wilderness based on the aesthetic values of the picturesque. Interlaced into Belgrand's publication, these photographs helped to diffuse the controversies surrounding the municipal government's projects. They did so through an ideological use of pastoralism, with all of its concomitant claims on the purity of nature, as a mechanism to mask the earlier disputes.

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[65] Donald English, *Political Uses of Photography in the Third French Republic, 1871-1914* (Ann Arbor: UMI Research Press, 1981), 23. English assumes that Collard was sympathetic to the plight of the Communards. Alisa Luxenberg offers an alternative interpretation, suggesting that Collard's photographs of the ruined city operated within the economy of commercial photographs. Alisa Luxenberg, "Creating *Désastres*: Andrieu's Photographs of Urban Ruins in the Paris of 1871," *The Art Bulletin* 80, no.1 (March 1998): 115. However, the Correspondence of Hippolyte Collard shows that Collard was in fact working on behalf of the Ministry of War, see Correspondence of Hippolyte Collard, Lucien Descaves Papers, International Institute of Social History, file 449.

The Lessons of Rome

By the time that the aqueduct of the Dhuis was completed in 1865 and the reservoir at Ménilmontant was fully operational in 1866, the city had significantly swelled in size with the annexation of the *faubourgs* in 1860. Furthermore, the metropolis's need for spring water had been exacerbated by the dire lack of rainfall since 1857. In preparation for diverting a larger water source, Belgrand had already begun to oversee the purchase of lands in the valley of the Vanne in Bourgogne in 1860 with the last parcel acquired in 1865.[66] Haussmann gained a decree of *utilité publique* for the aqueduct of the Vanne in 1866 in a process that he pushed through the Municipal Council much more swiftly than was the case with the Dhuis.[67]

Many of Collard's photographs that document the diversion of the Vanne's water also illustrate the rustic, picturesque aesthetics that mark his documentation of the Dhuis. Yet, other images of the new project reveal the municipal government's increasing confidence in sourcing spring water. Such photographs disclose a greater degree of visual bravado as already registered in the dramatic staging of Collard's photograph of the heroic struggle at the summit of Coquibu that pitted man against nature. There was, however, a pragmatic reason behind the more emphatic celebration of the conquest of nature in Collard's photographs of this project. While the municipal government had run the aqueduct of the Dhuis primarily underground, the new scheme required the construction of an elaborate gravity-operated aqueduct that, designed by the engineer Edmond Huet, would run above ground for 135 miles as it delivered water from

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[66] Belgrand, *Les Travaux souterrains de Paris*, vol. 4, 160.

[67] As Gay points out, there is a paucity of archival documentation regarding the diversion of the Vanne river. It is most likely that this project moved faster than the Dhuis because the municipal government needed to gain the decree of *utilité publique* no later than five years after the land was purchased to undertake the necessary expropriations. Gay, *L'Amélioration de l'existence à Paris*, 43.

Bourgogne and crossed the departments of the Yonne, Seine-et-Marne, Seine-et-Oise, and the Seine to arrive at the south of Paris at Montsouris.

As part of his documentation of the aqueduct, Collard photographed its colossal bridge running through the forest of Fontainebleau in 1870 (Fig. 3.10). While executing the photograph, Collard stationed himself at an angle to emphasize the structure's projecting span in a manner similar to his photographs of the bridges of Paris. As a result, the bridge's arch dynamically springs above the road below as it carries a double conduit of cast-iron water pipes, creating a monumental presence in an otherwise desolate landscape populated by a scattering of trees in the background.

For many contemporary observers, the enormous aqueduct centralized issues concerning the politics of representation that the projects raised more broadly. With its stacked arcades, the aqueduct was comparable with other Second Empire building campaigns such as the viaducts of Nogent-sur-Marne and the Pont-du-Jour.[68] Even more forcefully than these other projects, however, the aqueduct illustrated the government's references to the Roman Empire as an enduring model of statecraft. In order to begin to schemes to source spring water, Haussmann had stirred Napoléon III's passion for imperial Rome. As the Prefect recounted in his *Mémoires*, he was able to "win the trust of the Emperor" to undertake the projects "by reminding him of the magnificent Roman aqueducts, in which he had seen… the stupefying vestiges."[69] Further contributing to the state's explicit exploitation of a Roman example, Belgrand dedicated the second volume of his *Les Travaux souterrains de Paris* to precedent studies of Roman

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[68] For this comparison, see C.A. Opperman, "Aqueduct des Eaux de la Vanne à Moret," *Nouvelles Annales de la Construction* 19 (January 1873): 12.

[69] " Je réussis à gagner la confiance de l'Empereur en lui rappelant les magnifiques aqueducs romains, dont il avait vu, comme moi, les stupéfiants vestiges." Haussmann, *Mémoires du Baron Haussmann*, vol. 3, 296.

aqueducts. More than a rhetorical gesture, however, the new structure was literally beholden to imperial Rome's network of aqueducts as the Vanne aqueduct in fact traced the ancient Roman aqueduct of Sens through part of the French countryside.[70]

For detractors of the projects, however, allusions to the Roman urban imperium were both gratuitous and tyrannical. Indeed, Jolly had already articulated the despotic, if contradictory, implications of the aqueduct's reference to Rome:

> [While] you are inspired by the example of the Romans… there is really no analogy there to invoke; you should know that the actual aqueducts of Rome are not the antique work of ancient Romans, but, in part at least, the completely modern work of the popes. They don't owe any part of their existence to the vain conception of luxury and monumental splendor, but to the same necessity of procuring potable water… Believe me, Monsieur, if the Romans had had the water of the Seine at there disposition, which is of an impeccable quality, in place of the Tiber, which is not at all potable, they would have been so wise to not muse on the construction of aqueducts that so excite your administration.[71]

Robinet, however, did not find the municipal government's references to Roman precedent problematic. Furthermore, Robinet conceded to the parallels between the waterworks of Rome and those of Paris's municipal government: "We will have underground conduits like those of the ancient Romans; we will have arcades here in which this system can be used in valleys; we will have bridges to cross rivers, and lastly reservoirs to receive the water."[72] Yet, in recreating a "modern Rome" by means of Paris's projects, Robinet underscored that the new aqueduct travelled shorter distances than those of the Romans and was designed according to utilitarian

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[70] Belgrand, *Les Travaux souterrains de Paris*, vol. 2, 179.

[71] "Vous vous soyez inspiré de l'exemple des anciens Romains, car il n'y a vraiment là aucune analogie à invoquer; vous devriez savoir que les aqueducs actuels de Rome ne sont plus guère l'oeuvre antique de anciens Romains, mais, en partie du moins, l'oeuvre toute moderne des papes. Ils ne doivent nullement leur existence à une vaine conception de luxe et de splendeur monumentale, mais à la nécessité même de se procurer des eaux potables; Horace vous en a donné la raison en un seul mot (Tibrim flavum); et croyez bien, Monsieur, que si les Romains avaient eu à leur disposition l'eau de la Seine, qui est d'une qualité irréprochable, au lieu du Tibre, qui n'est nullement potable, ils auraient été assez sage pour ne pas songer à la construction d'aqueducs qui excitant tant votre admiration." Jolly, "Hygiène Publique. Question des eaux de Paris," 537-538.

[72] "Nous aurons des conduits souterrains comme ceux des anciens Romains; nous aurons des arcades là où ce système sera applicable aux vallées; nous aurons des ponts pour franchir les rivières, enfin des réservoirs pour recevoir les eaux." Robinet, *Eaux de Paris. Lettre à un conseiller d'état*, 71.

requirements rather than "by the vain conception of luxury and monumental splendor" as Jolly claimed.[73]

Yet, other commentators underscored that the aqueduct was not designed to be as efficient as it could have been, suggesting instead that the aqueduct's representational implications in fact took precedent. Belgrand gained wide acclaim for his novel application of *béton-aggloméré* to construct the aqueduct. In 1867, he subcontracted François Coignet, an early pioneer of concrete in France who had developed the material, to build the length of the aqueduct running through Fontainebleau for thirty-seven miles, a portion of which is illustrated in Collard's photograph.[74] For this undertaking, Coignet created the bulk of the aggregate with Fontainebleau sands, which were excavated from the site along which the aqueduct ran, fusing them together with lime and water to form monolithic concrete. Belgrand and Coignet thus mined the site's materials and transformed them, through chemical reaction, into a productive resource to forge and erect the aqueduct out of a single, mammoth block of artificial stone from which the structure was molded and its arches were struck. Belgrand was so satisfied with the construction method that he subsequently decided to forgo earlier plans to erect other parts of the aqueduct with iron and stone, and he instead built the entire structure of *béton-aggloméré*.

However, in his discussion of Belgrand's use of *béton-aggloméré*, Oppermann pointed out in an article in *Les Nouvelles Annales de la Construction* of 1873 that the material was not necessarily the most effective solution: "We think that this process is neither the best nor perhaps the most economic. Concrete exposed to the air deteriorates quite quickly." Instead, Oppermann

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[73] Robinet, *Eaux de Paris. Lettre à un conseiller d'état*, 72.

[74] On Coignet, see Peter Collins, *Concrete: The Vision of a New Architecture*. Second Edition (Montreal: McGill-Queens University Press, 2004), 27-35.

suggested that "vertical pillars, in regular masonry, or even in cast-iron, spaced at the limit of resistance of the bolted tubes, would suffice for the parts [of the aqueduct] above ground."[75] Challenging the claim that the aqueduct's methods of construction merely reflected utilitarian concerns, Oppermann instead attributed Belgrand's attraction to *béton-aggloméré* to concrete's Roman pedigree. Oppermann emphasized the point that the structure's form and the material did not necessarily require the imitation of Roman precedent. Rather, such historical references in fact played a rhetorical role as the state exploited them as tropes of imperial triumph.

In fact, Belgrand's building campaigns were critiqued more generally for their monumentality. In his *éloge* to Belgrand, Lalanne countered such criticisms raised against Belgrand's work and warned: "do not blame the eminent men who… [give] a monumental appearance to the works of public utility related to their purpose."[76] For Lalanne, such criticism was unwarranted because "these buildings provoke… a feeling of respect for the nation."[77] Writing in 1881, three years after Belgrand's death during the Third Republic, however, Lalanne's language is notably devoid of references to Empire and its celebration of Roman precedent. Instead, his rejoinder defends Belgrand's building campaigns on the terms of nationalism that prevailed in the early decades of the Third Republic.

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[75] "Nous ne croyons pas que ce procédé soit le meilleur ni même peut-être le plus économique. Le béton exposé à l'air se détruit assez rapidement. Des piliers verticaux, en maçonnerie ordinaire, ou même en fonte, espacés à la limite de résistance des tubes boulonnés, eussent suffi pour les parties au-dessus du sol naturel." C.A. Oppermann, "Aqueduct des Eaux de la Vanne à Moret," *Nouvelles Annales de la Construction* 19 (January 1873): 12. Because of the political uproar in France of 1870-1871, the local engineering press was slower to report on the aqueduct and the *Nouvelles Annales de la Construction* waited until 1873 to reproduce Collard's photograph. Replicated as a line drawing, the illustration's graphic quality mimics the abstract sensibility of the other technical drawings published along side it in the same tableaux.

[76] "Ne blâmons pas néanmoins les hommes éminents qui ont pensé ne pas payer un tribute exagéré aux idées contraires en donnant aux oeuvres d'utilité publique une apparence monumentale en rapport avec leur destination." Lalanne, *Notice sur la vie et les travaux de E. Belgrand*, 40.

[77] Public works have the capacity to "provoquer chez le navigateur étranger un sentiment de respect pour la nation." Lalanne, *Notice sur la vie et les travaux de E. Belgrand*, 40.

As the Second Empire fell as the aqueduct of the Vanne drew to completion, Lalanne was not alone in his attempts to reframe these building campaigns according to emerging ideologies of nationalism. In fact, the Third Republic government would engage such tactics more broadly as an attempt to distance the water sourcing projects from their associations with the old regime. To attend to this political maneuvering, it is worth considering the reproduction of Collard's photographs within the context of Belgrand's publication and at universal expositions since these sites for official state culture would act as structuring agents, which sought to reframe the reception of the projects through the circulation of images in the first decade of the Third Republic.

Sublime Encounters

Collard's additional photographs of the aqueduct map the colossal structure as its arcades soar as high as fifty feet and barrel over mutable, undulating topographies of hills, valleys, railroad tracks, and rivers. As Collard stationed himself atop towering summits to capture bird's-eye views and on distant plains to seize frontal elevations of the structure (Figs. 3.11 & 3.12), the aqueduct inevitably traverses the length of the photographic surface and pushes beyond its frame to create a sense of infinity as it dominates the countryside. These aesthetics of the technological sublime, which interpret the eighteenth-century sensationalist philosophies of Edmund Burke and Immanuel Kant through the lens of nineteenth-century industrialization, conjure notions of boundless wonder and formidable reverence in the face of the vast aqueduct. In David E. Nye's pivotal discussion of the technological sublime, such structures, which evidence the "conquest of

natural obstacles and forces," formalize "the triumph of reason in concrete form."[78] Because Collard's photographs express the industrialization of the landscape in such epic terms, it is little surprise that Belgrand reproduced many examples of them in the body of his publication in order to suggest heroic notions about the project.

However, the experience of viewing the aqueduct in the pages of the book precipitates particular modes of spectatorship that significantly differ from experiencing the aqueduct in the landscape. In fact, these photographs principally illustrate views of the aqueduct that could only be captured from the calculated position of the cameraman. Inside the publication, the photographs are frequently reproduced on double-page spreads in which the aqueduct shoots across the book's gutter. While the layout of the photograph on the page thus amplifies the structure's visual dynamism, the reproduced images are necessarily bereft of the range of sensorial effects associated with traditional conceptions of the sublime. Instead, the images operate within what Claudia Bell and John Lyall have termed the "accelerated sublime," which, in its photographic iteration, reduces the sensory characteristics of the sublime into a "purely retinal form" while multiplying distinctively visual encounters through mechanical reproduction.[79] While the full range of the sensorial aspects of the sublime is lost, the act of viewing is not only privileged, but it is predetermined and fixed within the confines of an artificial frame. There is, however, a particular logic to this emphasis on visual representation. As Bell and Lyall explain, "This diminished aesthetic sublime is the sublime of the armchair

[78] David E. Nye, *American Technological Sublime* (Cambridge: MIT Press, 1994), 77.

[79] Claudia Bell and John Lyall, *The Accelerated Sublime: Landscape, Tourism, and Identity* (Westport: Praeger, 2001), 42.

traveler."[80] In other words, reception plays a generative role within the mechanisms of the production of such images.

Within the context of Belgrand's publication, the experience of reception, which was mediated by the production, reproduction, and layout of images, elicited both traditional and novel modes of spectatorship. In the first instance, the viewer encounters the images within the familiar format of the book, which entails a material and tactile experience with the printed page. The act of viewing photographs in a book, as Armstrong points out, arose in "an experimental moment, right at the inception of the new medium, when the word came to haunt the photographic image… between the 1840s and 1880s."[81] While Belgrand's publication appeared at the end of this period, the integration of engineering photography within French publications then remained an innovative practice. From the very germination of the construction process, French state civil engineers had, at least by the mid-1860s, expected to publicize their building campaigns through the circulation of photographs. Belgrand's photographic enterprises for his projects were no different; only by the end of the 1860s, the mobilization of the medium had become more frequent and its applications had become more standardized. As a result, photographs of public works had extended to publishing by the 1870s.

As part of the accelerated circulation of photographs in the 1870s, Collard's images of the sourcing of spring water increasingly mediated how these projects were experienced. Once the water reached Paris at the reservoirs of Ménilmontant and Montsouris, it was distributed through the city in pipes running through the sewers to be consumed by Parisians through fountains and faucets. Given the veritable invisibility of the city's water distribution system, the

[80] Bell and Lyall, *The Accelerated Sublime*, 42.

[81] Carol Armstrong, *Scenes in a Library: Reading the Photograph in the Book, 1843-1875* (Cambridge: MIT Press, 1998), 3.

means of procuring spring water were abstracted, if not altogether forgotten. Instead, it was Collard's photographs that provided visual access to the distant countryside from which the water was sourced. As these photographs were the primary lenses through which the projects were understood, their importance should not be underestimated.

The meaning of Collard's photographs was further structured through their transmission in the early years of the Third Republic as the government exploited them in its propaganda campaigns. As the aqueduct of the Vanne continued virtually unabated into the early years of the Third Republic, its political meaning proved to be pliable in the face of France's political seachange. Although Haussmann had left office, Belgrand continued in his post as the director of the Service des Eaux et des Égouts while Alphand assumed the position as the director of the Commission des Travaux Publics of Paris. As a result, Belgrand's administration carried on despite the change in government as it continued to push the city's public works campaigns forward in the early years of the Third Republic. Even before Belgrand's publication was released, the public had encountered the water sourcing projects in displays organized by the City of Paris at the universal exposition held in Vienna in 1873 and in Paris in 1878. As the expositions publicized Belgrand's projects on a larger and more ambitious scale than the photographic album of the bridges of Paris on display at the universal exposition of 1867, they held even greater ideological consequences. Unlike the bridges, however, Belgrand's projects remained largely out of sight in the space of the city; the displays therefore furnished a virtual account of these campaigns, which allowed the public to embark on a carefully orchestrated visual exploration of the projects that existed beyond space and time.

The Second Empire government had already determined France's involvement in the 1873 universal exposition of Vienna in the summer of 1870.[82] Yet, the government would fall before the exhibition opened nearly three years later in May 1873, leaving the young Third Republic government to organize the country's contribution. The new government would exploit the opportunity to illustrate its ascendancy on an international stage by stamping the display materials with its own political aspirations. Furthermore, the government used the universal exposition of 1878 to mark its hegemony on national soil. In both cases, the exhibition materials organized by the Service des Eaux et des Égouts under the aegis of Belgrand were largely culled from work executed under the fallen regime. Nevertheless, the displays of the City of Paris would furnish individual galleries at both expositions that consecrated the projects in the name of the young government, which flaunted them as its own. In this act of political appropriation, these exhibitions further distanced the projects from their origins in the Second Empire, linking them instead with the political ambitions of the young government.

These two exhibitions contained nearly the same display materials and Collard's photographs played a principal role. Indeed, the prominence of these photographs, which were available in multiple reproductions, reflected the fact that the lion's share of documentation concerning the projects, particularly that of the Dhuis, was destroyed with Belgrand's office in 1871.[83] The display included documentation related to the entirety of the work of the Service des Eaux et des Égouts including its water sourcing and distribution projects as well as the sewers.

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[82] See the decree signed by Napoleon III in the documentation related to the universal exposition in Vienna of 1873 in AN F12/5010.

[83] At the universal exposition held in Vienna in 1873, the campaigns of the Service des Eaux et des Égouts furthermore served as the centerpiece of the exhibition galleries of the Ville de Paris. The display materials also featured displays of the parks of the Bois de Boulogne and Vincennes, drawings and models related to the voirie, bridges, and buildings erected since 1867. Kleitz, *Exposition universelle de Vienne en 1873,* 43. In 1878, the pavilion of the Ville de Paris included diverse operations of the Prefecture de la Seine including fine arts, public works, archeology, Eaux et égouts, and primary and professional teaching. Victor Favry, "Le Pavilion de la Ville de Paris," *L'Exposition universelle de 1878 illustrée* 124 (June 1878): 560-561.

The primary exhibition materials, however, illustrated the project for the Vanne, which included Collard's photographs of the water sources, drawings of the aqueduct, Belgrand's geological map, drawings and photographs of principal building campaigns as well as a complete photographic album dedicated to the aqueduct.[84] In galleries brimming with images and objects, Collard's photographs not only made visual connections among the links of Belgrand's hydraulic system, but provided evidence that publicity and questions concerning public legibility were integrated aspects of this network from its inception.

Press accounts of the displays of the Service des Eaux et des Égouts emphasize the technical components of the water sourcing and distribution system.[85] The ostensible transparency of technical description disentangled the building campaigns from their association with the Second Empire by providing an alternative discursive ground for conceptualizing the projects, which stripped away and undermined their social and historical significance. If the exhibition helped to forge new meanings in the photographs, this rhetorical gesture not only distanced the campaigns from their origins in the Second Empire, but it also operated as part of the Third Republic's adoption of science and industry as an official language of liberal Republican politics.[86] In fact, these emerging ideologies of nationalism, which linked national identity to scientific progress, additionally framed the campaigns of the Service des Eaux et des Égouts in Belgrand's *Les Travaux souterrains de Paris*. Here, Belgrand also assigned a

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[84] Kleitz, *Exposition universelle de Vienne en 1873,* 54.

[85] In addition to the sources already cited, see "Lea eaux et les égouts de Paris. À l'exposition universelle de 1878," *Revue Scientifique de la France et de l'étranger* (5 October 1878): 444-465.

[86] While this issue will be addressed in greater detail in the next chapter, it is worth pointing out the exhibition of the city's waterworks was not the only attempt within the pavilion of 1878 with which the government sought to distant itself from the fallen regime. As Colette Wilson has shown, Charles Marville's photographs on display in another exhibition space within the city's pavilion also operated to neutralize the memory of the Commune. See Colette Wilson, "Memory and the Politics of Forgetting: Paris, the Commune and the 1878 Exposition universelle," *Journal of European Studies* 35 (2005): 47-63.

privileged position to the technical aspects of the water sourcing campaigns. In fact, his emphasis on their technical characteristics would carry lasting consequences for the historical reception of these projects, which have frequently stressed their technical history instead of their social and political implications.

Conceived of as a cohesive oeuvre, Belgrand's publication formalized the manifold projects of the Service des Eaux et des Égouts into a comprehensive network of publicity for the circulation of the city's water and waste. Yet, the publication was released just as Belgrand's immense work on these building campaigns drew to a close. Nevertheless, the city's system of water sourcing and distribution was in fact part of an ongoing quest that continued well into the Third Republic. Of the 70,000 residences in the capital in 1873, 22,183 subscribed to the double system of potable spring water and local river water, while 15,706 subscribed only to the cheaper local water sources.[87] For all of the ongoing work involved in making Paris's potable water widely available, it was only in the 1890s that, as Matthew Gandy underscores, "the flow of water became modern, in the sense that we would now recognize."[88]

Nevertheless, Belgrand's earlier work, which advanced according to the constraints of incremental development, established the foundations for subsequent efforts. By integrating emerging modes of spectatorship into his building campaigns, the engineer ensured that the city's water sourcing and distribution system would be understood as a progressive and ameliorative effort. At the very center of this quest was the visual inscription of the countryside into the political economy of the modern city with its attendant regimes of modern vision and the aesthetics of science, technology, and nature.

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[87] Belgrand, *Historique de service des eaux, depuis l'année 1854 jusqu'à l'année 1874*, 5-6.

[88] Gandy, "The Paris Sewers and the Rationalization of Urban Space," 23-44. Goubert has traced the accessibility of water on a national level, see Goubert, *The Conquest of Water: The Advent of Health in the Industrial Age,* 191-196.

This chapter has analyzed Collard's photographs of the Second Empire's water sourcing efforts in terms of the ideological implications of their content as well as the layers of meaning that they accrued through their circulation. Instead of attempting to provide an exhaustive account of the many photographs in this publication, I have instead aimed to isolate major narrative threads, which were mobilized to naturalize the social and political implications of the campaigns. Furthermore, I have sought to cast the ideological charge of these images in sharper relief by examining the meaning that they produced through their transmission within sites for officials state culture including publications, the press, and universal expositions. While these sites of official publicity emerged out of the imperial spectacle of the Second Empire, the Third Republic deployed these photographs to support a new politics of public works in service of the government's new aspirations. Belgrand's contribution to this effort was one instance of a larger quest to exploit publicity to conceptualize public works according to the emerging liberal Republic values of the new government. The next chapter turns to the labors of engineers and photographers who coordinated a comprehensive effort to disseminate photographs of public works at universal expositions in Paris and abroad. In the first three decades of the Third Republic, the state's civil engineers would circulate photographs at these events to promote industry and technology as part of the intensifying discourse of French nationalism in the period.

CHAPTER 4. INSTITUTIONS OF REPRESENTATION

In 1889, the engineer Hippolyte Huguenin photographed a glowing lamp in the shape of an enormous egg enthroned beneath overlapping iron arches made of slender lattice trusses (Fig. 4.1). The venerated object is an example of one of about a dozen electric arc lights installed at important lighthouses throughout France. Among the earliest uses of electric light in the country, they illuminated the ocean's waters to warn mariners of risks before making "fatal mistakes" at critical points of danger in the sea[1] Disembodied from this context, the industrial artifact is here adopted as a freestanding centerpiece in a dazzling display mounted for the pavilion of the Ministère des Travaux Publics at the universal exposition in Paris of 1889. Located inside the pavilion, the lamp is raised on a podium and crowns a cubical installation comprised of models of public works as part of a collection of disparate artifacts deployed in service of the industrialization of France's built environment. The installation is pushed into a central core within the interior and encircled by a peripheral walkway for flocks of visitors to gaze at the impressive display that also includes drawings and photographs mounted on the surrounding walls of the room in a salon hang. The lamp sits between two windows and beneath a double-height ceiling that give way to a tower above. Taken collectively, these spatial voids, which flood the space with light, frame the egg-shaped artifact and help craft the exhibition's mise-en-scène. To take the photograph, Huguenin situated his camera equipment in a corner of the room

[1] This quote comes from Reynaud who, in his multiple capacities, was also the director of the Service des Phares. "Ce feux si multipliés pourraient exposer à de funestes méprises." Léonce Reynaud, *Mémoire sur l'éclairage et le balisage des côtes de France* (Paris: Imprimerie impériale, 1864), 3. On France's lighthouses, see Michael Schiffer, "The Electric Lighthouse in the Nineteenth Century: Aid to Navigation and Political Technology," *Technology and Culture* 48, no. 2 (April 2005): 275-305; Vincent Guigueno, *Au service des phares. La Signalisation maritime en France, XIXe-XXe siècle* (Rennes: Presses universitaires de Rennes, 2001); and Edward Eigen, "Subject to Circumstance: The Landscape of the French Lighthouse System," in *Landscapes of Memory and Experience*, ed. Jan Birksted (London: Spon Press, 2000), 87-104.

and meticulously framed the symmetrical composition with the monumental arc light at its very center. As the perspectival recession of the interior's projecting planes converge in the lamp, the artifact anchors the composition to formalize a dynamic image of industry on display within the pavilion.

The colossal arc lamp, the projecting outlines of the exposed iron structure inside the pavilion, the bold performance of industry captured within the frame of the photograph contribute to the discourses of progress brandished so fiercely at the universal exposition of 1889, which celebrated the centennial of the French Revolution. Gustave Eiffel's immense wrought-iron tower located on the Champ de Mars, which soared a thousand feet into the air, Ferdinand Dutert and Victor Contamin's vast iron Galerie des Machines, which then boasted the largest single-span in the world, and the railroad train, which transported visitors around the fairgrounds, accorded industry a privileged position at the exposition. Indeed, then Prime Minister Jules Ferry had conceived of the event as a bold statement of the French liberalism of the Third Republic written in the symbolic language of mass industry.[2] While the pavilion of the Ministère des Travaux Publics on the fairgrounds on the hill of the Trocadéro echoed the event's overarching industrial thematic, it had its own lineage that stretched back over several decades.

Since the beginning of the Third Republic, high-ranking state civil engineers working within the walls of the École des Ponts et Chaussées routinely designed exhibition spaces under the aegis of the Ministère des Travaux Publics and organized their contents for display. While their contribution on behalf of the ministry was interwoven into the organizing threads of the 1889 exposition, they had exerted an enormous amount of effort to construct an official account

[2] Silverman, "The Paris Exhibition of 1889: Architecture and the Crisis of Individualism," 71-91; Silverman, *Art Nouveau in Fin-de-Siècle France: Politics, Psychology, and Style*, 1-5; and Levin, *Republican Art and Ideology in Late Nineteenth-Century France*.

of the country's industrial accomplishment by staging displays of public works ever since the universal exposition held in Vienna of 1873. Their ongoing work for the ministry at universal expositions in the 1870s and 1880s blazed a trail through the shifting politics of the early Third Republic, only to find an especially sympathetic stylistic and political reception in 1889.

Huguenin's photograph of the ministry's pavilion was a product of this broader institutional alliance between the engineers of the Ponts et Chaussées and the state. Surely, the École's applications of photography were modest in the Second Empire and principally focused on training engineers in the basic applications of the medium. Beginning in the 1870s, however, the École's photography workshop adopted a dual mission as an institution for training engineers in photography and for producing official state publicity, and Huguenin directed the workshop's operations associated with this latter role. Furthermore, the École attached the photography workshop to its drawing office in the 1870s.[3] While the drawing office had functioned as a veritable graphics laboratory for the creation of an array of maps and drawings ever since the school's foundation, Fernand de Dartein and Auguste Choisy together took the reigns of the office in the first decades of the Third Republic and oversaw the majority of the designs for exhibition spaces for the Ministère des Travaux Publics at universal expositions and compiled their display materials. Engineers, working at the drawing office and photography workshop at the École, assumed official responsibilities as publicists for state building campaigns before the advent of modern public relations, foreshadowing the late twentieth-century development of a profession of *ingéniers culturels*. In this guise, they assembled photographs, which were drawn from a vast cadre of images previously commissioned in the field along with new photographs commissioned explicitly for display, into an integrated, mobile, and consumable account of the

[3] On the organization of the photography atelier within the drawing bureau, see *Exposition universelle à Paris en 1878. Notices sur les modèles, cartes, et dessins relatifs aux travaux des ponts et chaussées* (Paris: Imprimerie Nationale, 1878), 419.

country's public works, which circulated in the state's international networks of publicity at universal expositions.

As part of these institutions for the production of official state publicity, Hueginin was dispatched to the pavilions of the Ministère des Travaux Publics at the universal expositions held in Paris in 1878 and 1889 to photograph the exhibitions assembled by his colleagues at the École. His images were the basis of photographic albums commemorating these pavilions that he produced at the École. Furthermore, Hueginin's images were also reproduced within the onslaught of official publicity materials triggered by these expositions. Indeed, the pavilions themselves transformed the country's infrastructural elements of national circulation into a visually coherent network of representation. The pavilions were furthermore bursting with photographs and these displays formalized the ephemeral networks through which photographs travelled. Ultimately, Huguenin's photographs of these pavilions incorporated the ministry's exhibitions into the coordinated circulation of images of public works in the name of official state publicity.

The institutional channels for the production and circulation of photographs of public works at the École were also structured by changing conceptions of photography in the early decades of the Third Republic. While industrial photographs had been associated with advanced technical knowledge in the Second Empire and even conjured notions about industrial *richesse* as discussed in the second chapter, the status of photography was changing in the decades after the fall of the imperial regime as the medium increasingly became aligned with the sciences. In fact, photography's new importance began to unfold at the École beginning in the period. Louis Robert left his post as the school's instructor of photography in 1872 and was replaced by Louis-Alphonse Davanne who was then the vice president of the Société Française de Photographie.

With his appointment as the institution's instructor of photography, Davanne captured the attention of engineers at the École with his vociferous claims about photography's potential as a uniquely scientific medium. As part of a broader campaign to valorize photography in France, Davanne sketched an expressly scientific program for the medium in which he heralded photography as an autonomous medium, which contained the capacity to undertake its own discrete labor that could not be executed by other means. Working in collaboration, engineers and photographers at the École molded this new epistemic conception of photography anchored in scientific models, which held important ramifications for the transmission of photographs within the state's far-reaching publicity campaigns in the Third Republic.

Taking Hueginin's photograph as a point of departure, this chapter deals with the workshop's twin responsibilities as an institution for developing official state publicity and as a laboratory for photographic instruction. My aim in this chapter is thus twofold. First, I will explore the role of photography in the exhibitions of the Ministère des Travaux Publics at universal expositions in the 1870s and 1880s in which engineers at the École took up the exhibition as a medium for crafting a visual narrative of the nation's infrastructure. In the second part of this chapter, I will turn to parallel photographic developments at the École associated with the medium's instruction as engineers and photographers constructed a new epistemological conception for photography based in scientific models. By way of conclusion, I will argue that these concurrent applications of photography at the École operated in concert and forged an intertwined episode in the photographic practices of engineers working at the École in the 1870s and 1880s. Taken collectively, this episode helped to construct a new politics of public works that contributed to ideologies of progress associated with the Third Republic's adoption of science and technology as a new language of statecraft.

While the exhibition materials assembled by engineers frequently focalized public works in the French capital, their displays shed light on national infrastructure more broadly as they reflected the Third Republic government's ambitious public works campaigns throughout the country.[4] In attending to these expositions, I will often extend my field of inquiry beyond the geographic parameters of Paris that frame my larger study. Engineers' contribution to these exhibitions held important consequences for their photographic practices in general and their uses of the medium established a framework for understanding their additional applications of photography in the capital in the Third Republic, which I will take up in the following chapter. Furthermore, these pavilions contributed to novel questions concerning the modern city. The ministry's exhibitions took place in the French capital as well as other cities--including Vienna, Melbourne, and Philadelphia--that likewise hosted universal expositions as a means to proclaim their own urban modernity. Indeed, universal expositions publically extolled competition and concord among nations and the contributions of one country on view in a foreign city functioned as part of a shared quest to celebrate the prosperity of industrialized nations. As part of this effort, expositions played an important role in the broader spectacularization of the modern city as nations strategically sought to evidence their prosperity through urban modernization.

Publicity Circuits

As sites for the dissemination of official state culture, universal expositions had a catalyzing effect on the formation of official state culture in the second half of the nineteenth

[4] As I will discuss below, the wider scope of these exhibition materials responded to national efforts to develop the country's infrastructure outside of the capital in the wake of the so-called *Plan Freycinet*: an ambitious public works campaign that undertaken between 1878-1882.

century.[5] Ever since the Great Exhibition of 1851 held at the Crystal Palace in London's Hyde Park, universal expositions operated as institutions for the convergence of national identity with artistic and industrial display. The crux of these events was political as participating nations vied for international recognition through the exhibition of their wares. Working in this tradition, engineers at the École assembled France's extensive public works campaigns into displays of maps, models, photographs, drawing, and engineering instruments for the contribution of the Ministère des Travaux Publics at universal expositions in Vienna in 1872, in Philadelphia in 1876, in Melbourne in 1880 as well as in Paris in 1878 and again in 1889. To exhibit these collections, engineers working at the École orchestrated unified exhibition spaces for the ministry, either in galleries inside of larger exposition halls or in freestanding pavilions. Because public works do not typically contain interior spaces, especially not habitable ones, these displays required engineers to fashion interior environments for quintessentially exterior elements associated with territorial planning. This required adapting public works in format and scale for the framework of display. To meet this challenge, engineers plastered the walls of exhibition spaces with photographs and drawings in a salon hang in galleries modeled at the reduced scale of arc lights, model bridges, segments of steel railroad tracks, and jars brimming with lime, cement, and plaster.

While engineers created new materials for these expositions, they also brought together examples of objects from the school's archives. In addition to collecting photographs beginning in 1859, the École also amassed a depository of models, instruments, and machines. As with the school's collection of photographs, here, too, the state's building campaigns provided the

[5] On universal expositions in general, see Tony Bennett, *The Birth of the Museum: History, Theory, Politics* (New York: Routledge, 1995); Burkhard Bergius, "Temporary Illusions," *Daidalos* 6 (December 1982): 63-75; and Paul Greenhalgh, *Ephemeral Vistas: Expositions Universelles, Great Exhibitions, and World's Fairs, 1851-1939* (Manchester: Manchester University Press, 1988).

materials, which the École acquired to create a material record of the engineering profession and to serve as pedagogical tools in engineering training.[6] By assembling these archives, engineers at the École decontextualized the objects from the circumstances of their initial application in the field and assigned them new value within a material chronicle of their profession's history. As they took these objects out of their archives and paired them with new materials fashioned explicitly for universal expositions, the status of these wares again shifted once they were mobilized as display objects, which, laden with complex social relationships, emerged at the nexus of production and reception.

Engineers at the École assembled and often circulated the very same exhibition materials at a variety of the ministry's displays around the world, refining and improving upon their selection over the course of the 1870s and 1880s. Immersed within the concentrated scenery of the exhibition gallery, visitors saw a spectacular industrial reality seemingly unlike any other. Walter Benjamin of course described the experience created in this kind of highly orchestrated atmosphere as the "phantasmagoria" of universal expositions, which "glorified the exchange value of the commodity."[7] For Benjamin, along with many scholars working in a Marxist tradition, universal expositions were a quintessential demonstration of the emerging capitalist marketplace.[8] The commodity indeed served as the language *par excellence* of an entire host of spectacular sites of mass culture that emerged in the nineteenth century, ranging from the museum to the department store. Even before French engineers turned to the language of the commodity as an organizing principle for their displays, Americans had already conceptualized

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[7] Walter Benjamin "Paris- Capital of the Nineteenth Century," in *The Arcades Project*, trans. Howard Eiland and Kevin McLaughlin (Cambridge: Harvard University Press, 1999), 18.

[8] Giorgio Agamben, *Stanzas: Word and Phantasm in Western Culture* (Minneapolis: University of Minnesota Press, 1993), 36-39; Harvey, *Paris*, *Capital of Modernity*, 205-207.

industrial development in a similar vein. Since the mid-nineteenth century, American engineers and industrialists had constructed artifacts of the industrial age into cohesive displays at industrial exhibitions where they also assigned a privileged role to photography.[9] As private industry principally guided the display practices at such exhibits in the United States, it is worth recalling that French engineers' explicitly tied--whether intentionally or not--their own exhibition practices to the emerging aesthetic conventions of the capitalist marketplace.

During the 1870s and 1880s, engineers working at the École regularly organized exhibition materials for the ministry during what were perilous decades for the young Third Republic government. The French had lost the Franco-Prussian war after a series of military defeats in the summer of 1870. Napoleon III surrendered to the Prussians in September 1870 and the Second Empire government witnessed its downfall as Parisians declared the new Third Republic while the capital was still under Prussian siege. After the French created an armistice with the newly founded German Empire in January, Adolphe Thiers was elected president in February 1871. However, the revolutionary government of the Paris Commune briefly ruled in the spring of 1871 before being violently suppressed by Thiers's troops. Thiers's presidency was nevertheless short lived. He resigned in 1873 and Marshal Mac-Mahon took the reigns of the Third Republic government until 1879. While Thiers and Mac-Mahon shared strong monarchist loyalties, liberal Republicans came to power in the 1880s under the sway of Prime Minister Jules Ferry during the presidencies of Jules Grévy and Sadi Carnot.[10] During this twenty-year period of seismic political upheaval, engineers at the École nevertheless succeeded in constructing a

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[9] On industrial displays in the United States with an emphasis on the role of photography in them, see Julie Brown, *Making Culture Visible: Photography and its Display at Industrial Fairs, International Exhibitions and Institutional Exhibitions in the United States, 1847-1900* (London: Routledge, 2001).

[10] R.D. Anderson, *France, 1870-1914: Politics and Society* (London: Routledge, 1977); James Lehning, *To Be a Citizen: The Political Culture of the Early French Third Republic* (Ithaca: Cornell University Press, 2001); and Jean-Marie Mayeur, *Les Débuts de la IIIe Republique, 1871-1898* (Paris, Ed. Du Seuil, 1973).

remarkably durable visual account of the country's public works for display, which often transcended the vicissitudes of Third Republic political history.

The appearance of stability that marked the exhibition strategies of the engineers also characterized their work in general during the 1870s and 1880s. By contrast, monumental architectural projects in the capital stood in a more tenuous state, particularly in the 1870s. Sizeable debate preceded the Third Republic government's ultimate decision to complete the Paris Opera, which, conceived as the centerpiece of Second Empire patronage, remained unfinished until 1875.[11] The Hôtel de Ville, which was burned in the Commune, was left in ruin for a decade while the young Third Republic debated rebuilding the monument.[12] The Tuileries Palace, which was also burned in the Commune, and St-Cloud, which was ravaged in the Prussian invasion, were left in blighted states for years after their initial destruction by order of the government to warn against future insurgence.[13] While these architectural projects were mired in questions concerning the fraught political role of architectural representation with the rise of the new government, public works campaigns often continued unabated in the capital.

The fact that these campaigns persisted in the wake of this political turmoil reflected the endurance of the municipal government's institutional channels for public works. If Haussmann had developed these channels, Alphand subsequently harnessed them in his role as the director of the Commission des Travaux Publics of Paris and he saw to the continuation of public works

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[11] Christopher Mead, *Charles Garnier's Paris Opera: Architectural Empathy and the Renaissance of French Classicism*, 145.

[12] Pierre Casselle, "Le Conseil Municipal et la reconstruction de l'Hôtel de Ville, 1871-1890," in *Livre du centenaire de la reconstruction de l'Hôtel de Ville, 1882-1982* (Paris: Bibliothèque administrative, 1982), 17-24.

[13] Kirk Varnedoe, "The Tuileries Museum and the Uses of Art History in the Early Third Republic," in *Salloni, galerei, musei e loro influenza sullo sviluppo dell'arte de secoli XIX e XX*, ed. Francis Haskell (Bologna: C.I.H.A., 1979), 63-68.

campaigns in the early Third Republic. Still, public works could not escape questions concerning political representation; by eliciting notions of national mobility and collective improvement, these campaigns supplied the state with potent industrial material for shaping political representation with implicit ameliorative connotations. As engineers continued to press forward with public works campaigns in the early years of the Third Republic, they also chronicled a stable account of their work through their exhibition practices for the Ministère des Travaux Publics. As a major component of these displays, photographs advanced claims for political stability and industrial progress in the face of the political chaos, which undermined the stability of the young Third Republic.

Preparation for the universal exposition in Vienna of 1873 officially marked the École's involvement with the organization of the ministry's displays at universal expositions. It had been scarcely seven years since Austria's own defeat in the Austro-Prussian war in 1866, which brought an end to the German Confederacy. Emperor Franz Joseph had agreed to the Austro-Hungarian Compromise in 1867 and the dual monarchy had taken Vienna as its principal capital. Still riding the economic wave of the *Gründerzeit*, Austro-Hungary exploited the exposition of 1873 to flaunt its own urban modernization as substantial progress had been made on the Ringstrasse in Vienna's city center. Under imperial patronage, the exposition was organized at Prater Park situated along the Danube River to the west of the newly built-up Ringstrasse. Yet, attendance to the exhibition was dismal as the exhibition would soon find itself in the midst of economic upheaval once the Viennese stock exchange crashed eight days after the exposition opened on 1 May 1873, triggering a bust cycle in western Europe and the United States throughout the rest of the decade.[14]

[14] John Stamper, "The Industry Palace of the 1873 World's Fair: Karl von Hasenauer, John Scott Russell, and New Technology in Nineteenth-Century Vienna," *Architectural History* 47 (2004): 227-250.

Napoleon III had signed an imperial decree on 2 July 1870 declaring France's involvement in the exposition only seventeen days before France officially proclaimed its ill-fated war on Prussia.[15] The exposition subsequently fell into the hands of the newly formed Third Republic government, which used it as an opportunity to ameliorate its tenuous political position on an international stage. For its contribution to the event, the Ministère des Travaux Publics charged the École with the responsibility of organizing its exhibition materials. With the aid of Choisy and de Dartein, Léonce Reynaud oversaw the organization of photographs of public works to be displayed as part of the ministry's installation.[16] It is scarcely a coincidence that the École's professors of architecture, who were consumed with their own historical research in which they assigned a privileged position to graphic representation, should assume the responsibility for organizing exhibition materials on behalf of the ministry.

While photographs commissioned by these engineers had already circulated at the universal exposition of 1867 in the Second Empire, Reynaud's project was of an entirely different scale. Under the auspices of the ministry, Reynaud organized twenty-two individually bound albums of photographs illustrating routes, bridges, railroads, navigation, waterworks, ports, lighthouses, and civil architecture located throughout the country.[17] To compile these albums, Reynaud drew upon the archive of photographs amassed by the École beginning in 1859, which fortuitously escaped damage during the political upheavals of 1870-1871. In fact, the École itself had been heavily fortified during the siege of Paris. Important manuscripts were secured in the basement, and the engineers sandbagged the doors and windows of the library to

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[15] See the decree signed by Napoleon III in the documentation related to the universal exposition in Vienna of 1873 in AN F12/5010.

[16] On Reynaud's involvement, see Fernand de Dartein, *M. Léonce Reynaud, sa vie et ses oeuvres* (Paris: Imprimerie A. Lahure, 1885), 224.

[17] ENPC PH127.

shelter its precious holdings.[18] Reynaud subsequently organized the École's silvery images within these albums typologically so that individual structures registered as part of ostensibly completed infrastructural networks of national mobility and state patronage. If such a system of classification operated within the engineers of Ponts et Chaussées's tradition of conceptualizing building as an interconnected element of larger territorial agglomerations, Reynaud's organizing principle accrued further political meaning as he exploited these photographs as exhibition materials.

Reynaud assembled these albums from photographs executed during the Second Empire, which illustrated the state's newly completed building campaigns. Yet, the Prussians and the ensuing Paris Commune had ravaged the capital along with other parts of the country. Ignoring the destruction, the photographs revealed the country's built environment in a pristine state of completion, and thus supplanted lived reality with images of the country as it stood before the recent upheavals. Certainly, the industrial and architectural achievement shown in the photographs was not the new government's accomplishment. But photography's capacity to suspend embodied space and time became a political tactic, which the Third Republic government harnessed as it exported these images as official state publicity. By adopting these photographs as its own, the Third Republic government stamped them, along with the structures they illustrated, with its own political ideology.

In the wake of the social and political pandemonium in the period, the engineers of the Ponts et Chaussées undertook additional photographic practices, which cast Reynaud's project in sharper relief. They had commissioned a photographic inventory of a handful of the more than

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[18] *Procès-verbaux des séances du conseil*, February 1871, reg. 5, ENPC, 169.

three hundred bridges that were damaged during the Franco-Prussian War of 1870-1871.[19] The engineers of the Ponts et Chaussées were dispatched to repair many of them and they commissioned photographer Gabriel Blaise to document their rehabilitation of these structures.[20] Moreover, they again enlisted Collard in the spring of 1871 to document further destruction during the Prussian invasion. His photographs depict the collapsed bridges of Athis-Mons and Choisy-le-Roi, located to the south of Paris, which were hastily brought down by French troops as they retreated back to Paris in an unsuccessful ploy to hold off the German infantry from invading the capital.[21] Although once potent symbols of the bonds linking nation and industry, as well as capital and countryside, the bridges lay in ruin almost completely immersed in the waters of the Seine. Such images of destruction, however, were nowhere to be found in Reynaud's photographic albums on display at the universal exposition of Vienna. Certainly, the circulation of his pristine and unblemished account of the county's public works paralleled the Third Republic effort to shape an official account of cultural memory as the young government also tightly controlled and even censored the reproduction of images of the Paris Commune as early as May 1871.[22]

Inside the ministry's exhibition space at the exposition building at Prater Park, visitors encountered Reynaud's photographic albums arranged on tables for perusal alongside books on methods of construction and course manuals from the École des Ponts et Chaussées.[23] Within the

[19] This statistic comes from C.A. Oppermann, "Relèvement du Pont Bineau sur la Seine, près Courbevoie-Neuilly," *Nouvelles annales de la construction* (December 1871) :100.

[20] ENPC PH102.

[21] ENPC PH105.

[22] English, *Political Uses of Photography in the Third French Republic, 1871-1914*, 65.

[23] M. Kleitz, *Exposition universelle de Vienne en 1873. Section française. Rapport sur les travaux du genie civil*, 4.

comprehensive display environment created by Reynaud, which left no space in the gallery unused, the informal display of the albums encouraged traditional modes of spectatorship associated with the material experience of leafing through books. While the act of turning the album's pages to examine the photographs might appear to betray the technological feats on display in the gallery along with the spectacular performances of viewing that universal expositions precipitated more broadly, the circumstances of contemplating these photographs prompted greater intimacy with the subject of the photographs. Here, the very act of viewing the albums elicited a tactile experience, which required the visitor to pause to handle the albums, thus creating an attentive encounter with the images.[24] That these photographs should require the observer's time and attention attests to the importance placed on the photographic account of the country's public works.

Indeed, Reynaud's photographic albums remained the de facto official photographic account of French public works throughout the 1870s and 1880s as de Dartein and Choisy circulated nearly the same photographic albums at successive universal expositions in Paris and abroad. Following the initial mobilization of the photographs in Vienna, however, the role of the engineers at the École in the preparation of the ministry's exhibitions became more amplified. As the École remodeled and extended its building in the mid-1870s, it also enlarged the photographic workshop in size and scope.[25] At this time, the École attached the photography workshop to its drawing office as "its new and powerful auxiliary."[26] Blurring the boundaries

[24] On the tactile experience of holding photographs, see Geoffrey Batchen, *Forget me not: Photography and Remembrance* (Princeton: Princeton Architectural Press, 2006), 8-16; and Elizabeth Hutchinson, "They Might be Giants: Carleton Watkins, Galen Clark, and the Big Tree," *October* 109 (Summer 2004): 52. On questions concerning attention in relationship to the nineteenth-century observer, see Jonathan Crary, *Suspensions of Perception: Attention, Spectacle, and Modern Culture* (Cambridge: MIT Press, 1999).

[25] *Procès-verbaux des séances du conseil*, March 1876, reg. 5, ENPC, 366.

[26] *Exposition universelle à Paris en 1878*, 419.

between engineering pedagogy, practice, and state desires, the drawing office and the photography workshop functioned in tandem to produce publications and publicity for the École as well as for the Ministère des Travaux Publics during the Third Republic.[27]

The coupling of these services at the École institutionalized Choisy's and de Dartein's roles as the organizers of the pavilions for the Ministère des Travaux Publics. Although they had already assisted Reynaud with his preparations of the exhibition materials for the ministry's gallery in Vienna in 1873, they would take charge, moreover, of the design of exhibition galleries and free-standing pavilions for the ministry along with the preparation of their contents to systematize the circuits of publicity through which photographs of public works traveled for the expositions in Philadelphia in 1876 and Melbourne in 1880 as well as in Paris in 1878 and 1889. Taken collectively, these efforts helped to galvanize the drawing office and photography workshop at the École into institutions for the production and circulation of official state publicity under the aegis of the Third Republic government.

On the occasion of the Centennial Exposition in Philadelphia in 1876, the engineers of the Ponts et Chaussées planned an individual pavilion on behalf the Ministère des Travaux Publics that stood apart from France's substantially larger exhibition hall also organized for the occasion. De Dartein assumed the responsibility of designing the structure located among more than two hundred buildings erected at Fairmount Park in Philadelphia, which ranged from the Main Exhibition Building designed by Joseph Wilson and Henry Pettit, a colossal exhibition shed made of polychromed iron and wood, to the art gallery, Memorial Hall, designed by

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[27] On the organization of the photography atelier within the drawing bureau, see: *Exposition universelle à Paris en 1878*, 419.

Herman Schwartzmann in a Beaux-Arts idiom.[28] De Dartein's pavilion was sited in between a rectangular building, which served as the headquarters of the French commission in Philadelphia, and a small centrally-planned octagonal pavilion for the display of objects made of zinc. In designing the building for the ministry as well as organizing its exhibition materials with Choisy, de Dartein acted as architect, curator, and publicist. Once the pavilion's materials were prepared in Paris, they made their way to the port at Le Havre along with the materials for the building itself--including its ceramic tiles, enamel signage, iron frame, and wooden doors--where they crossed the Atlantic Ocean to the wharf at New York and finally travelled to Philadelphia.[29] There, they were received by the engineers Édouard Lavoinne and Jules-Victor-Justin d'Hervilly who were temporarily dispatched abroad to oversee the construction of the pavilion along with the organization of its contents on-site according to the specifications of the engineers back in Paris.

De Dartein crafted the pavilion as a cohesive vision, which created a microcosm for French public works campaigns (Fig. 4.2). The engineer designed the single-story building in the form of a modest rectangular box built from an iron frame with a pitched roof. The outline of the building's lightly colored iron skeleton contrasts against its patterned brick walls, while boldly colored ceramic tiles mark the entrance canopy and decorate the interior. Competing for space against the dazzling backdrop of mosaic tiles on the walls of the pavilion's interior were densely packed artifacts of France's engineering prowess including machines, engineering instruments,

[28] On the architecture of the exhibition buildings, see Bruno Giberti, *Designing the Centennial: A History of the 1876 International Exhibition in Philadelphia* (Lexington: University Press of Kentucky, 2002).

[29] AN F12/5014.

maps, drawings, and photographs. Inside, de Dartein organized the exhibition spaces according to the dwarfed scale of the numerous models on display.[30]

Upon entering the pavilion's interior, visitors saw an enormous map of French transportation routes decorating its back wall. De Dartein supervised the creation of the map at the École, which served as the centerpiece for the ministry's exhibitions through 1889. While the map illustrated geographic mobility across the lands and waters of France, it also formalized visual links among the nation, its public works, and spectators. The diverse objects displayed within the pavilion--illustrating roads, railroads, navigation, lighthouses, waterworks, and mines registered as interwoven elements against the backdrop of the map, which emphasized the exhibition's display materials as a synoptic network for circulation. As part of the gallery's network of display objects, Reynaud's atlases of photographs, which were assembled for the exposition in Vienna three years earlier, were again casually stacked upon display tables for the perusal of visitors. The pavilion staged for the Centennial Exposition in Philadelphia not only established the model for subsequent pavilions for the ministry, but the engineers in fact adopted this very structure as their launch pad for the universal exposition held in Paris in 1878.

At the universal exposition of 1878, de Dartein reinstalled the pavilion first designed for the fair in Philadelphia, which contributed to a new model of international publicity that flaunted the mounting importance of public works for the national government. On the broadest level, the 1878 exposition provided the Third Republic government with the first opportunity to hold its own exposition in Paris and evidence its political ascendance on national soil. Rather than build on the fairgrounds on the Champ de Mars, which was the principal site of the Second Empire's universal expositions in 1855 and 1867, the government instead located the exposition on the hill

[30] "Une semblable installation a paru préférable à celle des grandes nefs, où les modèles se trouvent écrasés par les proportions de l'édifice." *Exposition universelle à Paris en 1878*, 13.

of the Trocadéro facing the old fairgrounds across the Seine to distinguish the event from those of the fallen regime.[31] Here, the pavilion of the Ministère des Travaux Publics also held particularly important implications for the administration. In the first place, the ministry officially claimed that the international success of its displays in Vienna and Philadelphia "imposed the obligation of increasing its efforts" for the exposition in Paris.[32] In addition, the display played a vital role for the Third Republic in the face of the government's rising stakes in public works.

The exposition opened in May 1878 scarcely four months after the national government had begun to launch an ambitious public works campaign in January. In an effort to revitalize the French economy in the wake of the international depression triggered in 1873 by stimulating the steel and iron industries, then Ministre des Travaux Publics, Charles de Freycinet, sketched a broad program for the expansion of national railroad lines, canals, river navigation, and ports. The so-called *Plan Freycinet*, with its exceptional budget of six billion francs shared by the state and private industry until the program ended in 1882, constituted a watershed event in the history of France's transformation into a modern capitalist nation.[33] In this context, the government adopted the pavilion of the Ministère des Travaux Publics as an unparalleled opportunity to

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[31] Sylvie Clavel and Isabelle Chalet-Bailhache, ed. *Paris et ses expositions universelles. Architectures, 1855-1937* (Paris: Centre des monuments nationaux, 2008), 27. Pieter van Wesemael, *Architecture of Instruction and Delight: A Socio-Historical Analysis of World Exhibitions as Didactic Phenomenon, 1798-1851-1979* (Rotterdam: 010 Publishers, 2001), 329.

[32] "Les success obtenues à l'étranger imposaient l'obligation de redoubler d'efforts au jour de notre Exposition nationale de 1878." *Exposition universelle à Paris en* 1878, 10.

[33] Yasou Gonjo, "Le 'plan Freycinet,' 1878-1882: un aspect de la 'grande dépression' économique en France," *Revue Historique* 23, no. 1 (July-September 1972): 49-86.

display its rising investment in public works as a conduit for the optimistic recovery of the national economy.[34]

In light of the changing status of public works on the national level, the pavilion of the Ministère des Travaux Publics accrued multiple meanings. For the event, the engineers of the Ponts et Chaussées reconstructed the pavilion first mounted in Philadelphia on the grounds of the Trocadéro. In fact, they had disassembled the pavilion and kept it in storage, along with its contents, for nearly two years since the closing of the Centennial Exposition.[35] For the exhibition in Paris, de Dartein supervised the reinstallation of the single-story structure, which he retrofitted by mounting a tower and spire over the pavilion's entrance to make it more impressive and pinpoint the structure on the fairgrounds.

Because the pavilion would ultimately become the subject of publicity photographs executed by Huguenin, it is worth turning to the structure, which functioned in concert with photographs and other exhibition materials, to form an information pavilion for communicating particular notions about public works as official state culture. Indeed, exposition buildings have historically served as a site for experimenting with ideas about architecture itself and the pavilion was not a neutral receptacle for the display of exhibition materials. With its brilliantly pattered surfaces and polychromed iron frame, de Dartein crafted a cohesive atmosphere in which he sought to communicate notions about industrial culture through architecture. Although appearing aesthetically remote from engineers' austere designs for concrete aqueducts and iron spans in the period, de Dartein's pavilion shared a common decorative and structural solution with a range of

[34] This point is underscored in William Walton, *Paris Known and Unknown*, vol. 3 (Philadelphia: G. Barrie & Son, 1898), 338.

[35] On the reuse of the old pavilion, see M. Lalanne to the Ministre des Travaux Publics, 30 April 1878, AN F/12/3222.

industrial buildings in the second half of the nineteenth century, including Victor Baltard's pavilions for Les Halles in Paris, of 1852-1870, and Jules Saulnier's Menier Chocolate Factory in Noisiel, of 1872-1874. As these buildings were all designed with iron frames, their architects experimented with non-load bearing and infill walls. For de Dartein, brick and ceramic tile provided inexpensive, if durable, materials to activate the wall's surface with vibrant patterns and colors supported by an iron skeleton.[36]

If the dissolution of the structural wall was associated with industrial buildings in general in the nineteenth century, its history coalesced in exposition buildings in particular. The structural behavior of the iron frame was most theatrical when conceived as a web filled with transparent glass. This was, of course, Joseph Paxton's formative solution for the Crystal Palace of 1851, based on his earlier experiences with greenhouse design, whose ferro-vitreous envelope dissolved into an atmospheric illusion in the interior. For practical purposes, Paxton's design was better adapted to larger exposition halls, which left the curtain wall unencumbered as a means to exhibit the spectacle of its diaphanous web. By contrast, this solution did not lend itself to smaller pavilions in which the building's walls were used as surfaces densely covered with exhibition materials. For de Dartein, the heavily decorated surface of the pavilion reflected his own conception of architecture in general and the use of iron in particular.

Reynaud played an important role in the application and theorization of iron-frame construction in the second half of the nineteenth century.[37] De Dartein was a staunch follower of

[36] The building's polychromy can also be understood as part of the rich interest in the technique in nineteenth-century Europe. See David Van Zanten, "Architectural Polychromy and the Life in Architecture," *The Beaux Arts and Nineteenth-Century French Architecture*, ed. Robin Middleton (London: Thames and Hudson, 1982), 196-215.

[37] On Reynaud's ideas about iron, see Karen Bowie, "Les polytechniciens et l'architecture metallique," in *Le Paris des polytechniciens*, 203-211. However, Reynaud was hardly alone in his interest in iron. In the French context, the 1850s had already witnessed vociferous debates over the appropriate uses of the material: notably between Viollet-le-Duc, who argued that iron should not be used to replicate historical forms from previous periods, and Louis-Auguste Boileau who had employed the material to copy medieval forms. On these debates, see Bernard Marrey, *La*

the doctrine of his former teacher and colleague; and Reynaud's writings on iron in his *Traité d'architecture* shed light on de Dartein's design aspirations for the pavilion. "Polychromy," wrote Reynaud, "appears to play a very important role in iron construction."[38] Concerned that the very slenderness of the iron skeleton's outline might cause its members to vanish into the surface of the wall, the engineer underscored the importance of highlighting its outline with color. The emphasis on painted iron recalls Owen Jones's interior polychrome scheme for the Crystal Palace as well as the vernacular practice of half-timbered houses with infill and their timbering that was decorated or painted with oxblood.[39] Writing about the use of iron himself, de Dartein raised the question: "Why in fact hide this element created in a relatively precious manner and that so often plays the principal part in the stability of the structures for which it is used?"[40] It is therefore little surprise that de Dartein clearly outlined the iron skeleton of the pavilion with colored paint, which reflected the particular importance placed on the visual signification of iron by the engineers.

For Reynaud, structural and material applications of iron carried lofty implications. Motivated by his associations with the Saint-Simonians in the 1830s, the engineer theorized

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querelle du fer. Eugène Viollet-le-Duc contre Louis-Auguste Boileau (Paris: Linteau, 2001). On the use of iron in the French context in general, see Sanghun Lee, *Technology and Form: Iron Construction and Transformation of Architectural Ideas in Nineteenth-Century France, 1830-1889* (Ph.D. diss., Massachusetts Institute of Technology, 1996). Although not dealing uniquely with iron, Gottfried Semper's celebrated "Four Elements of Architecture" of 1852 offers a critical theorization of the non-load-bearing wall, see Rosemarie Haag Bletter, "On Martin Fröhlich's Gottfried Semper," *Oppositions* 4 (October 1974): 146-153.

[38] "La polychromie parait donc devoir jouer un rôle très-important dans les constructions en fer." Reynaud, *Traité d'architecture*, vol. 2, 87.

[39] "Il est essentiel, en effet, de faire ressortir avec une grande netteté une ossature qui est énergique au fond, mais qui, réduite à ses seules ressources, pourrait ne pas le paraitre suffisamment, à raison de son peu en volume. Or la couleur est appelé à donner satisfaction à cette exigence." Reynaud, *Traité d'architecture*, vol. 2, 87.

[40] "Pourquoi en effet cacherait-on cet élément compose d'une matière relativement précieuse et qui a si souvent la part principale dans la stabilité des constructions où on l'emploie?" Dartein, *M. Léonce Reynaud, sa vie et ses oeuvres*, 31. De Dartein is also quoted in Bowie, "Les polytechniciens et l'architecture metallique," 207.

building as a cultural formation whose contemporary renovation would bring the promise of social renewal. In an effort to forge a new cultural synthesis unique to the nineteenth century, Reynaud sought to achieve a modern social revitalization by aligning architecture with industrial and scientific progress along with the study of ancient monuments.[41] In fact, Reynaud's personal architectural vision was enmeshed within broader claims on architecture's capacity to bind people as part of collective culture. De Dartein reminds us of his mentor's axiom: "'style' in architecture, said Reynaud, is the epoch 'first, the individual after.'"[42] De Dartein's pavilion served as an ideal laboratory for experimenting with the potential of iron to craft an architectural expression appropriate for the industrial age. Although an ephemeral structure, the pavilion also served as a traveling platform for display. As if a kit of parts, the building had been assembled and reassembled on two continents, and its very reuse conjures notions of material and technical efficiency associated with modern industrial culture.

The pavilion's polychromed iron cage was but one element that assembled the structure's vibrantly colored walls. Although the building's iron communicated ideas about modern industrial culture, its brilliantly colored ceramic tiles tied it to historicist precedent associated with the shimmering mosaics of Byzantine architecture, a subject of de Dartein's personal research into the Lombard Romanesque.[43] However, with its flamboyant appearance on the

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[41] De Dartein, *M. Léonce Reynaud, sa vie et ses oeuvres*, 119.

[42] "'Le style' en architecture, a dit M. Reynaud, c'est l'époque 'd'abord, l'homme ensuite.'" De Dartein, *M. Léonce Reynaud, sa vie et ses oeuvres*, 70. The quote comes from the *Traité* in which Reynaud himself built on an axiom of the naturalist Georges-Louis Leclerc, comte de Buffon, when he wrote that "Le style c'est l'homme, a dit un éloquent écrivain, en parlant des oeuvres littéraires. En architecture, le style davantage: c'est l'époque d'abord, l'homme ensuite," Reynaud, *Traité d'architecture*, vol. 2, 86. De Dartein explained the mechanism through which architecture developed as part of collective culture when he wrote: "les évolutions artistiques étaient le résultant de cataclysmes politiques, de bouleversements sociaux, de puissantes influences extérieures déterminées par de nouvelles relations de peuple à peuple, de grands progrès accomplis dans la culture intellectuelle de nations jusque-là peu avancées," de Dartein, *M. Léonce Reynaud, sa vie et ses oeuvres*, 119.

[43] Fernand de Dartein, *Étude sur l'architecture lombarde et sur les origins de l'architecture romano-byzantine* (Paris: Dunod, 1865-1882). Notably, de Dartein began this study as Reynaud's student at the École des Ponts et

fairground, the building did not necessarily elicit the industrial aspirations of its architect. One critic found it to have such a strong "oriental character that one does not suspect that it is for French public works" and suggested that its "beacon resembles an Arab minaret from afar and the enameled surfaces of the façade of the porch announces the entrance of a mosque."[44]

Certainly, with the building's central tower, the pavilion might be taken for a mosque or a church. This slippery signification of architectural form is not unique to de Dartein's design of the pavilion. Rather, it reflects the broader tendencies of architects in the second-half nineteenth century who adopted traditional elements of religious architecture as a means to foster an elevated architectural language for buildings with new secular functions including exposition halls and museums as exemplified by Paxton's use of a basilican plan for the Crystal Palace or Alfred Waterhouse's application of a westwork on the façade of the Museum of Natural History in London. Even though de Dartein's use of the tower raised questions among critics, the success of the pavilion in the eyes of the state suggests that he effectively ennobled the pavilion by making it appear as a temple to industry on the fairgrounds.

De Dartein and Choisy likewise reassembled the contents of the pavilion with minor revision as they had been displayed two years earlier in Philadelphia.[45] These materials included Reynaud's photographic albums, which were augmented for the occasion. Not only were new images added to the collection, but the engineers of the Ponts et Chaussées also commissioned

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Chaussées. On the context of the intellectual history of de Dartein's research on Lombard architecture, see Bergdoll, *Léon Vaudoyer: Historicism in the Age of Industry*, 123.

[44] "Mais ce pavillon, également en fer et briques et décoré de terres émaillées, a si bien un caractère oriental qu'on a peine à y soupçonner les Travaux publics français. Son phare coquet ressemble de loin à un minaret arabe et les revêtements émaillés de la façade du porche annoncent l'entrée de quelque mosquée." Paul Sédille, "L'Architecture française au Champ de Mars," *Gazette des beaux-arts* 2, no. 18 (1878): 272.

[45] The principal additions to the contents of the pavilion in Paris included a collection of materials of construction. *Exposition universelle à Paris en 1878*, 494. Also on the pavilion, see Louis Félix Calinaud, "Notice sur le pavillon du ministère des Travaux publics de l'exposition universelle de 1878" *Encyclopédie d'architecture* 8, no. 2 (1879): 53.

the photographer Jules Duclos to reshoot a number of public works to replace flawed photographs incorporated into the earlier albums.[46] Moreover, the former typological organization of the photographic albums had been done away with. For the exposition of 1878, de Dartein and Choisy reclassified the photographs geographically by region and department.[47] The new categorization of the photographs brought the images into closer alignment with de Dartein's impressive map illustrating national circulation routes. As de Dartein and Choisy ensured that the viewer could immediately situate these photographs on the map of France, they further systematized geographic and representational links among exhibition materials for the viewer.

As the ministry's exhibitions traveled, the reproduction of similar exhibition materials and exhibition environments helped produce a stable account of public works on behalf of the ministry and the state. In addition to integrating photography within the display materials for the 1878 exposition, the engineers of the Ponts et Chaussées also created a photographic album to commemorate the pavilion itself. Overseen by Huguenin in the photographic workshop at the École, the publication integrated photographs of the interior and exterior of the structure along with plans and elevation drawings of the architecture of de Dartein's pavilion.[48] In the photographs, Huguenin privileged mural, symmetrical compositions of the exterior and interior spaces of the pavilion in the vein of elevation drawings (Figs. 4.3). The structure's brilliantly colored atmosphere registered in tonal variations of gray, with the exception of a single drawing

[46] *Exposition universelle à Paris en 1878*, 329. I will address the motivations behind the reorganization of these photographs in the next section of this chapter.

[47] *Exposition universelle à Paris en 1878*, 491-492.

[48] Fernand de Dartein, *Exposition universelle de Paris. Pavilion des travaux publics* (Paris: École des Ponts et Chaussées, 1878). The attribution of the album to de Dartein follows the tradition of attributing photographs to the architect of the building photographed rather than to the photographer.

of the pavilion's mosaics reproduced by color lithography (Fig. 4.4). When considered collectively, the photographs and drawings together created compositional and aesthetic consistency within the album. Particularly notable in the album are its effects on the interior spaces of the pavilion. As already mentioned, the interior of the exhibition space seemed like an anomalous space for public works, which are inherently exterior structures. A photograph of the interior taken on axis with the central walkway rigidly orders the dizzing proliferation of photographs and model, which operate as decorative scenography (Fig. 4.5). Laying bare the contents of the building on the flat pages of the album, the photographs of the interior propelled them into the flow of publicity images mobilized by these engineers. Photographs had served until now to reproduce public works expressly for the purpose of display. But the photographs in this album transformed the pavilion itself into an infrastructural element that galvanized the ephemeral circuits through which photographs traveled--linking together photography, the pavilion's architecture, and the display materials.

Although erected in Philadelphia in 1876 and in Paris in 1878, the pavilion for the Ministère des Travaux Publics was not transported to Melbourne for Victoria's International Exhibition of 1880. Instead, the engineers of the Ponts et Chaussées assembled the ministry's exhibit inside the Beaux-Arts exposition hall designed by Joseph Reed in Carlton Gardens. In the nearly twenty years since Victoria had gained independence from New South Wales in 1851, the colony's settlers had reaped unrivalled wealth from the region's natural gold deposits while dispossessing the indigenous population of their lands in the process. By the time of the International Exhibit in 1880, Melbourne had rapidly transformed from a colonial outpost into a

modernized city. And Victoria staged its own universal exposition to place itself on the map of modern industrialized nations.[49]

Engineer Ferdinand Ernest Journet, who was stationed in Melbourne to oversee the on-site installation on behalf of the ministry, calibrated de Dartein's specifications for the exhibition space within the larger exposition building. For the occasion, Journet swathed the gallery's walls and display tables with red fabric. He modified de Dartein's original measurements of the glass display windows to account for the insufficient height within the exhibition hall and he replaced some of the display tables so that they would be flush with the gallery walls. Journet had also changed the position of a model viaduct by one meter so that it was visible to the viewer from outside of the gallery's entry: thus improving the "general effect" of the exhibit. Furthermore, the engineer would position the new cabinets that he ordered to display albums of photographs of public works, which were too large for the vitrines that were already on site.[50]

The collection of photographs, which had been reorganized in 1878, was again on display in Melbourne. However, the exposition also marked a milestone in the photographic practices of the engineers of the Ponts et Chaussées at universal expositions. Reynaud's voluminous publication, *Les Travaux publics de la France*, was completed before his death in February 1880, and in time to be included in the exposition. In this publication, Reynaud reproduced the very photographs that he first assembled for the universal expositions in Vienna in 1873. Taking the

[49] Graeme Davidson, "Festivals of Nationhood: The International Exhibitions," in *Australian Cultural History*, ed. Samuel Louis Goldberg and Francis Barrymore Smith (Melbourne: Cambridge University Press, 1988), 158-174; Ian Morrison, "'The Accompaniments of European Civilization': Melbourne Exhibitions, 1854-1888," *La Trobe Journal* 56 (Spring 1995): 6-11.

[50] M. Journet to M. Dartein, 26 October 1880, AN F/12/5022. While Journet's letter was intended to apprise his supervisor back home in Paris of the remaining details for the exhibition gallery for the French Ministère des Travaux Publics at the International Exhibition organized by the colony of Victoria, he also penned an expansive digression concerning life in the colony loaded with polarzing tropes about the supposed inevitability of colonizer over colonized, and one race over another.

original typological classification of the photographs as the organizational spine of the project, Reynaud oversaw the publication's five volumes.[51] The entire project included fifty photographs reproduced by phototypography. By compiling these photographs for publication, Reynaud codified the principal format for photographic displays at universal expositions that would outlast the ephemeral expositions for which the images were initially assembled.

If Reynaud's publication was among the most enduring artifacts of these engineers' displays, it was not the last time that these exhibition materials would be brought together. The largest and most dazzling exhibition of France's public works was assembled for the 1889 universal exposition in Paris. The Third Republic launched the exposition to celebrate the centennial of the French Revolution. As the fair sparked the construction of the colossal iron Eiffel Tower and the Galerie des Machines, engineering aesthetics became the exposition's lingua franca. Indeed, the event appeared at the tail end of Jules Ferry's ministry and it served as the platform for a spectacular performance of science and technology as the official language of liberal Republican politics.[52]

The Ministère des Travaux Publics once again enlisted the engineers at the École to orchestrate its contribution to the exposition. For their display in 1889, the engineers would depend on their exhibition practices, which they had developed since 1873 in Vienna, to orchestrate a similar installation that now sat comfortably in the overarching industrial theatrics of the national exposition. De Dartein again took charge of the design and installation of the

[51] While Reynaud oversaw the entire publication, each volume was edited individually. Lucas and Fournié edited the first volume on roads and bridges, Collignon the second on railroads, de Lagrené the third on interior navigation, Voisin-Bey the fourth on ports, and Allard the fifth on lighthouses. *Exposition universelle à Paris en 1878*, 426. Léonce Reynaud, ed. *Les Travaux publics de la France*. 5 vols. (Paris: Rothschild, 1882).

[52] Silverman, "The Paris Exhibition of 1889: Architecture and the Crisis of Individualism," 71-78. Silverman, *Art Nouveau in Fin-de-Siècle France: Politics, Psychology, and Style*, 1-5; Miriam Levin, *Republican Art and Ideology in Late Nineteenth-Century France*.

pavilion. The engineer designed a completely new building for the occasion in the manner of the one that he first designed for the Centennial Exposition--although over twice its size--clad in vibrantly colored mosaic tiles (Fig. 4.6).[53] Sited on the hill of the Trocadéro across the Seine from Eiffel's soaring iron beacon on the Champ de Mars, the building included a principal rectangular pavilion flanked by two smaller structures on either side. Above the central pavilion, de Dartein erected an enormous tower that terminated in a lighthouse lantern directly above the building's entrance, which made this engineering artifact isomorphic with the pavilion's architecture. A staircase leading up the spire provided visitors with the opportunity to climb the four-story tower and step out onto viewing platforms to observe panoramic views of the surrounding fairgrounds.

After passing beneath an overhang at the pavilion's entrance with drawn curtains, visitors entered light-filled exhibition spaces strewn with civil engineering artifacts. On the interior, de Dartein left the pavilion's iron structure exposed and traced its outlines with trusswork. Beneath a filigree of overlapping arches, de Dartein densely covered the pavilion's interior walls with drawings and photographs. Models of bridges, viaducts, and aqueducts, which were culled from the École's own collection, filled the interior displays. While de Dartein had situated models against the gallery walls in previous installations for the ministry, this time he collected them in the center of the exhibitions spaces. As the visitor was forced to circulate around the colossal spans of the models, the displays created an imposing effect upon the viewer. In fact, the models in particular created the greatest draw among the public because they reproduced familiar structures found across France in miniature within the center of Paris. As one journalist pointed

[53] On the pavilion, see Henri de Parville, *Causeries scientifiques* (Paris: Rothschid, 1890), 439-512; and *Exposition universelle à Paris en 1889. Notices sur les modèles, dessins et documents divers relatifs aux travaux des ponts et chaussées et des mines* (Paris: Imprimerie Nationale, 1889).

out, upon encountering models of recognizable public works in the pavilion, one heard exclamations: "But it's my port," "Here is our canal," "It's Calais," or "It's Cherbourg."[54]

The École's photographic workshop again called on Huguenin to create a commemorative album of Dartein's pavilion just as he had done eleven years earlier, in 1878.[55] The album again illustrated the pavilion's architecture and exhibition spaces. While the photographs of the previous album of 1878 privileged symmetrical views of the building, this album instead employed angular views of the pavilion's exterior and interior. As illustrated in Huguenin's photograph of the great arc lamp with which this chapter began, these images emphasized the spatial dynamism of the building and its displays in the vein of a projective drawing. Moreover, the album included photographs executed from the viewing platforms atop the building's tower that incorporated panoramic vistas of the fairgrounds and pulled the Eiffel Tower itself into the orbit of the visitor's visual experience in the pavilion and, by extension, in the photographs (Fig. 4.7). Taken collectively, the album stressed the visual and material manifestations of the industrial aesthetics asserted so exuberantly by the organizers of the exposition.

If the engineers of the Ponts et Chaussées had been promoting this very language of industrial culture at universal expositions for nearly twenty years, it was finally at the fair of 1889 where their efforts resonated as part of a collective campaign to craft national identity through an ideology of industrial progress. Pleased with the success of de Dartein's pavilion, the ministry left the exhibition intact after the exposition closed on 31 October 1889 and opened the

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[54] "'Mais c'est mon port; voilà notre canal; c'est Calais, c'est Cherbourg,'" de Parville, *Causeries scientifiques*, 442.

[55] Fernand de Dartein, *Album du pavilion du minstère des travaux publics à l'exposition universelle de 1889* (Paris: École des Ponts et Chaussées, 1890).

building once a week as a museum of public works and construction.[56] Yet, when the ministry again displayed many of the same exhibition materials at the universal exposition in Paris held eleven years later in 1900, they became an embarrassment to the ministry and the engineers as their displays had grown outdated in comparison to the public works displayed by neighboring countries.[57] As Debora Silverman has argued, the 1889 exposition was the swansong of "an era of aggressive secular individualism and laisser-faire capitalism" as the Third Republic government subsequently adopted a more moderate political stance in the 1890s.[58] In the wake of the changing political climate, the national government would abandon the industrial stagecraft epitomized by the 1889 exposition in favor of the Art Nouveau heralded at the next universal exposition held in Paris in 1900. And this dramatic stylistic renovation only further dampened the reception of the machine aesthetics still brandished by the ministry's pavilion.

Another factor that surely contributed to the dated quality of the ministry's display was the changing status of technology at the 1900 exposition. The stylistic turn announced by the exposition elicits Art Nouveau's concomitant associations with the Rococo revival, craft, and a new organicism derived from sinuous, plant motifs, which had launched a surface critique of industrialization and deadened the technocentrism that was flaunted so exuberantly in 1889. Yet, there were important exceptions to this trend such as the elevated moving walkway, upon which up to 40,000 visitors glided around the fairgrounds for two and a half miles; the largest refracting telescope ever constructed located in the Palais de l'Optique; and the Paris Métro whose first line

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[56] *Procès-verbaux des séances du conseil*, June 1889, reg. 9, ENPC, 125.

[57] *Procès-verbaux des séances du conseil*, July 1910, reg. 10, ENPC, 23. In 1898, many of the models making up the ministry's display were given to the Musée des Arts et Métiers. Many were subsequently placed in the Musée des Travaux Publics, which opened in 1939. After the museum closed in 1955, its contents were dispersed among numerous collections. See Bertrand Lemoine, *Un musée retrouvé. Le Musée des travaux publics, 1939-1955* (Paris: École des Ponts et Chaussées, 1991).

[58] Silverman, *Art Nouveau in Fin-de-Siècle France: Politics, Psychology, and Style*, 44.

opened during the course of the exposition to transport sightseers from the exposition grounds in western Paris across the city to the summer Olympic games then being held in the Bois de Vincennes.

More often, however, machines were not generating the new spectacle of technology as in 1889. Rather, electricity and its apparent lack of material qualities flared in 1890. In one instance, electric lighting created brilliant displays such as the colossal Chateau d'Eau, whose fountains sparkled behind multicolored incandescent lamps, or the dances of Loïe Fuller who, illuminated by spotlights and lanterns, was bestowed the title "*la fée électricité*."[59] In another case, early cinema also erupted at the exposition, and was even included in the official classification of wares.[60] More startling, however, were the applications of the new medium in the exposition's popular attractions, which included projections of the films of the Lumière brothers in the old Galerie des Machines built in 1889 as well as Raoul Grimoin-Sanson's Cinéorama, which mimicked a hot air balloon ride as visitors stood in a gondola surrounded by screens onto which ten film projectors cast moving images simulating flights high above Paris, Brussels, Nice, Biarritz, Bizerte, Tunisia, Sousse, Southampton, and Barcelona. Indeed, the material qualities of electric light and early cinema were even more evanescent than those of photography. Because of their very ephemerality, these new technologies did not constitute a style on their own; rather, they became diffused in the exposition as their screens, projections,

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[59] Kermit Swiler Champa, "A Little Night Music: The Play of Color and Light," in *Architecture of the Night: The Illuminated Building*, ed. Dietrich Neumann (New York: Prestel Verlag, 2002), 20-22; Dietrich Neumann, "Architectural Illumination before the Twentieth Century," in *Architecture of the Night: The Illuminated Building*, 10. The use of electricity in the 1900 exposition is also discussed in two recent books on Loïe Fuller, see Ann Cooper Albright, *Traces of Light: Absence and Presence in the Work of Loïe Fuller* (Middletown: Wesleyan University Press, 2007), 91-98; and Rhoda Garelick, *Electric Salomé: Loïe Fuller's Performance of Modernism* (Princeton: Princeton University Press, 2007), 63-85.

[60] On early cinema at the exposition, see Emmanuelle Toulet, "La cinéma à l'Exposition universelle de 1900," *Revue d'histoire modern et contemporaine* 33, no. 2 (April-June 1986): 179-209.

and halos formed layers of affect and moving images that animated and electrified the twisting contours of the Art Nouveau associated with the exposition.

As technology became increasingly dispersed, it is scarcely surprising that the displays of the ministry, which still celebrated the mechanistic language of industrial culture, appeared obsolete in 1900. Indeed, eleven years earlier, electricity itself had been part of the spectacle of industry as it illuminated the Eiffel tower, bridges, and certain pavilions including the arc light on display at the pavilion of the Ministère des Travaux Publics. Electricity's gaining ubiquity in 1900 constituted another direction of technological development whose course would also be steered by engineers in the first decades of the twentieth century--a subject which will be developed in further detail in the next chapter. For the moment, however, it is worth underscoring that the turn of the twentieth century would bring an end to the engineers' work as publicists for official state culture.

Writing nine years after the universal exposition of 1900 at the time of Choisy's death, de Dartein recollected his activities involved in the organization of the pavilions for the ministry. In addition to what he called the "ordinary occupations" involved with teaching engineering students, he explained that both men had also been charged with "the work brought about by the participation of the Ministère des Travaux Publics at international expositions that then followed one another at short intervals."[61] De Dartein only mentioned their use of photography in the planning of these expositions in passing in letters scribed between engineers for the sole purpose of finalizing the details of the pavilions. In fact, these engineers rarely discussed the application

[61] "Aux occupations ordinaires-- leçons et concours d'architecture; direction du bureau des cartes et plans; publication du Portefeuille de l'École et de l'Atlas des Ports maritimes—s'ajoutait le travail occasionné par la participation du Ministère des Travaux publics aux Expositions internationales que se succédaient alors à courts intervalles." De Dartein, "Notice sur la vie et les travaux de M. Auguste Choisy," 11-12.

of the medium albeit for official statements concerning its benefits for tracking the construction of public works. Indeed, they also remained virtually silent about their roles in the state's publicity campaigns. Nevertheless, their contribution to these campaigns was important and their use of photography was pervasive in them. To shed further light on what might otherwise appear to be an enigmatic practice, it is worth returning to the halls of the École to consider the additional applications of the photography workshop in the 1870s and 1880s where photographers voiced more powerful claims on the role of the medium.

A Photographic Turn

As engineers working at the École assigned photography a privileged position at universal expositions, photography concurrently gained a more prominent place in the teaching workshop. Louis Robert, who had taught photography at the École since 1858, terminated his teaching assignment in 1872 after having replaced Regnault as the director of Sèvres the year prior.[62] Unable to enlist a *polytechnicien* and military engineer of the Génie, Aimé Civiale, for the vacant post, the school hired Louis-Alphonse Davanne who subsequently taught photography at the institution to the graduating class until 1886. Davanne also played an important role in the Société Française de Photographie as its vice-president and then president from 1867-1901. Among the many societies to arise in the 1850s with the advancement and diffusion of photography as their mission, the Société Française de Photographie maintained an overwhelmingly scientific and technical interest in the medium.[63] Davanne, a chemist by

[62] *Procès-verbaux des séances du conseil*, February 1872, reg. 5, ENPC, 185.

[63] On the Société Française de Photographie, see André Gunthert, "Naissance de la Société française de photographie," in *L'Utopie photographique*, ed. Michel Poivert (Paris: Le Point du jour, 2004), 14-24; Paul-Louia

training, was deeply embroiled in the society's broader cultural effort to transform photography into an autonomous medium anchored in scientific models.[64] Davanne found an atmosphere particularly welcoming to this undertaking at the École where he attempted to extend his mission to valorize photography as a quintessentially scientific medium.

As Robert had done earlier, Davanne also instructed students in the latest methods for producing and reproducing photographs. In his course manual, Davanne also precisely elucidated the relevance of photography for state civil engineers by homing in on the diversity of photographic applications for the profession:

> In the most special circle of works that lie with engineers, photography is called to render frequent services. These services will be so numerous than one ought to better understand the set of processes, the relationship between them, and the applications that the engineer can undertake either by himself or, more often, in managing the agents that are under his order.[65]

Davanne went on to describe the merits of the medium for the profession, citing its usefulness for the study of far-flung places as well as for the reproduction of plans and maps at different scales. In particular, Davanne underscored the role of documentary photography for state engineers:

> Photographs made at construction sites allow us to follow projects day-by-day during the course of their execution either in their totality or in their details, which can be

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Roubert, "Les fonds de la distinction. Le financement des sociétés photographiques du XIXe siècle," *Études photographiques* 24 (November 2009): 18-41; and McCauley, *Industrial Madness*, 41. It should also be pointed out that Robert was also an active member of the society and, indeed, Victor Regnault served as the society's first president.

[64] Gunthert, "La Rétine du savant. La Fonction heuristique de la photographie," 28-45; Ellenbogen, "Camera and Mind," 86-115. While both Gunthert and Ellenbogen have considered Davanne's theory of photography, neither have discussed the photographer's relationship to the École.

[65] "Dans le cercle plus spéciales travaux qui incombent aux ingénieurs, la Photographie est appelée à rendre de fréquents services; en ces services seront d'autour plus nombreux que l'on aura mieux compris l'ensemble de procédés, leurs liaisons entre eux et les applications que l'ingénieur peut en tirer soit lui-même soit plutôt en dirigeant les agents qui sont sous ses ordres." Louis-Alphonse Davanne, *Conférences sur la Photographie* (Paris: ENPC, 1883), 2.

> communicated by a simple dispatch of negatives. This method has been employed in all of our great modern constructions including the Opera, the Palais du Trocadéro, the gallery of the universal exposition of 1878, the great railroad bridges, etc. A final photograph will record the importance of work in its completion.[66]

Finally, Davanne enumerated the benefits of archiving photography among engineers: "If one judges it necessary to archive these projects, from their beginning to their end, one can reproduce, circulate either abroad or in the diverse places in France in libraries of study holding a rich collection of documents."[67] Indeed, Davanne's course manual for the École remains one of the most thorough written accounts of photography's applications among French state civil engineers.

In his courses, Davanne also conveyed a panoramic conception of the medium to engineering students. Providing students with a theoretical ground for understanding the relevance of the medium, Davanne wrote:

> Under the name Photography we must understand the ensemble of processes that have for their goal to obtain, by the action of light, the image of things that light renders visible to our eyes. This definition shows us that photography substitutes itself for the hand of man in all circumstances in which there is a question not only to create, but also to copy, ranging over all of the branches of human knowledge to which it has become an indispensible auxiliary.[68]

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[66] "Les epreuves faites sur les chantiers permettrons de suivre et de collectionner jour par jour les travaux en cours d'exécution soit dans leur ensemble soit dans leur détail… cette méthode à été employée pour toutes nos grandes constructions modernes tells que l'opéra, le palais du Trocadéro, le galerie de l'Exposition de 1878, les grandes ponts de chemin de fer, etc., etc. Une dernière épreuve constatera l'importance des travaux accomplis en leur réussite." Davanne, *Conférences sur la Photographie*, 2. In this respect, Davanne's description of photography's merits on the construction site was also exploited by architects. See, for example, Bergdoll's description of Visconti's application of photography in the construction of the Louvre in the Second Empire, Bergdoll, "A Matter of Time: Architects and Photographers in Second Empire France," 100.

[67] "Si on le juge nécessaire les archives de ces travaux, de leur début à leur achèvement peuvent être multiplier, échangées contre d'autres en formant ainsi soit à l'étranger soit sur divers points de la France des bibliothèques d'études renfermant une riche collection de documents." Davanne, *Conférences sur la Photographie*, 2.

[68] "Sous le nom Photographie nous devons comprendre l'ensemble des procédées que ont pour leur but d'obtenir par l'action de la lumière l'image des choses que la lumière rend visible à nos yeux. Cette définition nous montre la photographie se substituant à la main de l'homme dans toutes les circonstances où il s'agit non de créer, mais de copier, en s'étendant à toutes les branches des connaissances humains dont elle est devenue l'auxiliaire désormais indispensable." Davanne, *Conférences sur la Photographie*, 2.

Although forgoing photography's immediate relevance to civil engineering in his definition, Davanne made claims on photography's material properties and automation as defining characteristics of the medium and propelled photography's applications into an ostensibly limitless field of possibilities. Concomitant with his teaching responsibilities at the École, Davanne was embroiled in a mission to characterize photography as a fundamentally scientific medium. As part of his effort, Davanne would embark upon a conversation with engineers and their applications of photography that would have consequences for both fields.

Immediately after taking up the post at the École, Davanne would seek to ameliorate photographic applications at the school beginning with Reynaud's earliest compilation of photographs for the universal exposition of 1873 in Vienna. In his service for the Société Française de Photographie, Davanne frequently compiled the official reports on photography for both universal expositions and for the society's yearly exhibitions held in Paris. Undoubtedly because of his new affiliation with the École, he often remarked upon the photographic practices at the institution. Nevertheless, Davanne provided a lukewarm review of Reynaud's project. In his report on photography at the exhibit in Vienna of 1873, he lamented that the medium's developments in France languished behind those of other countries.[69] While noting the advances made by this "automatic pencil" in state administrations including the Ponts et Chaussées, he nevertheless suggested that engineers could make certain improvements by further centralizing their efforts. Although Davanne underscored the work of Michel Berthaud, Charles Marville, and Auguste-Hippolyte Collard as exemplary photographers whose images provide, "at first glance,

[69] Louis-Alphonse Davanne, *Exposition universelle de Vienne en 1873. Section française. Rapport sur la photographie*, vol. 3 (Paris: Imprimerie Nationale, 1875), 183-218. Gunthert also notes Davanne's critique of photography at the exposition, see Gunthert, "La Rétine du savant. La Fonction heuristique de la photographie," 31.

the interesting point and goal searched," he scorned the administration for too often hiring "a good number of photographers often different from the operator of the neighboring city."[70] Davanne was unmistakably speaking of Reynaud's undertaking with its vast assortment of images executed by myriad photographers. While Davanne agreed that this system might be financially prudent, he advised that the administration could improve the quality of its photographs by consistently employing the same photographer trained in the administration's particular needs.[71] Undoubtedly, the engineers at the École took heed of Davanne's criticism. When de Dartein and Choisy came to reassemble their photographs of public works for display at the Centennial Exhibition in Philadelphia in 1876, they indeed commissioned new photographs to replace earlier ones of poor quality in Reynaud's initial selection.[72]

In his report on the eleventh exhibition of the Société Française de Photographie in 1876, Davanne again criticized the photography workshop at the École. While he named the École as the only institution functioning under the Ministère des Travaux Publics that operated its own "photographic operation," he warned that it "is insufficient for the service that it could be called to render."[73] He feared that it would soon become overloaded in the face of its mounting

[70] "Ces épreuves exposées ont été faites par un grand nombre de photographes différents souvent même par l'opérateur de la ville voisine; ce système, qui peut être économique, n'est pas le meilleur; il semblerait préférable qu'une administration s'attachait toujours le même opérateur; car, pour toutes les applications divers, un spécialiste se munit d'appareils plus conformes au but désire, il choisir le point de vue mieux qu'un praticien pris au hasard. " Davanne, *Exposition universelle de Vienne en 1873*, 213. Excoffon and Michel cite Davanne's reports, see Excoffon and Michel, "L'École des ponts et chaussées et la photographie," 15-16.

[71] Davanne makes this point in his report on the exhibition of the Société française de photographie in 1878 where he states that engineers of the Ponts et Chaussées "souvent emploient la Photographie à grands frais et sans obtenir les résultats que l'on serait en droit d'attendre d'opérateurs spécialement instruits pour ce genre d'opération." Louis-Alphonse Davanne, "Rapport sur la XI° exposition de la Société française de photographie," *Bulletin de la Société française de photographie*, 261.

[72] *Exposition universelle à Paris en 1878*, 494.

[73] "L'École des Ponts et Chaussées… est peut-être la seule section dépendant de ce ministère qui possède une installation photographique… Cette installation est encore insuffisante pour les services qu'elle pourrait être appelée à rendre." Davanne, "Rapport sur la XI° exposition de la Société française de photographie," 261.

responsibilities. He pointed out, moreover, that Portuguese engineers were making greater strides in photography. Davanne reported that the photographic workshop founded in 1872 in Lisbon under the auspices of Portuguese Ministry of Public Works had developed "remarkable results" in photographic processes.[74] Davanne adopted the example of the atelier in Lisbon to chide the one of the Ponts et Chaussées, stating that "we regret not having been able to find an official workshop as comprehensively organized in France." But Davanne also took this as an opportunity to chart a course of action to ameliorate the workshop at the École. He envisioned that it should serve as "a sort of central atelier to which could be attached a few secondary ateliers formed on the principles of the division of the general service."[75]

In addition to the state-driven publicity campaigns undertaken by the photography workshop during the 1870s, the photographic practices of the École became increasingly aligned with Davanne's own ambitions for the medium. Along with his fellow members of the Société Française de Photographie, Davanne sought to legitimize photography as an autonomous medium, and they explored photography's ability to produce, rather than merely represent, scientific knowledge by probing the limits of the latent image. Nowhere was photography's

[74] "Nous trouvons donc en France dans l'administration quelques tentatives d'ateliers photographiques officiels, dotés d'une manière insuffisante et ne pouvant s'étendre assez pour rendre les services qu'on serait en doit de demander et d'attendre d'une grande et belle organisation. Pour trouver cette organisation d'ensemble, il nous faut aller à Lisbonne, dans ce pays si tranquille du Portugal, qui, dans son calme politique, poursuit paisiblement la réalisation de véritable progrès. Là, la place et les subsides accordées largement à la Photographie : un vaste atelier ont été fondé, en 1872, sur la proposition du Ministre des Travaux publics… cet atelier donnait déjà en 1874 de remarquables résultats, et il nous a envoyé cette année une exposition complète, comprenant les procédés aux sels d'argent, la photolithographie, la gravure photographique en relief pou la typographie, la gravure en taille-douce, de planches galvonoplastiques, etc., etc. Parmi ces productions si diverses, un grand nombre sont d'une exécution remarquable, d'autres nous présentent des procédés nouveaux, et en adressant à l'atelier de Lisbonne de justes félicitations, nous regrettons de ne pouvoir trouver en France un atelier officiel aussi largement monté." Davanne underscores the Portuguese atelier's developments in silver nitrate, photolithography, photogravure, copper engraving, and galvanoplastic plates. Davanne, "Rapport sur la XI˚ exposition de la Société française de photographie," 263.

[75] "Il serait à désirer que l'École des Pont et Chaussées, imitant le Dépôt d'artillerie, devint une sorte d'atelier central auquel se rattacheraient quelques ateliers secondaires formé sur les principales divisions du service général." Davanne, "Rapport sur la XI˚ exposition de la Société française de photographie," 261.

capacity to perform its own autonomy more pronounced than in the acclaimed photographic experiments of astronomer Jules Janssen. The Société Française de Photographie's exhibition of 1876 included images taken by the astronomer's "photographic revolver." Janssen had fashioned this camera to record Venus's transit across the sun in 1874 with sequential images registered by the device's automated movement. In light of the camera's ability to record this "transient phenomenon," Janssen famously claimed that "the photographic surface is the retina of the scientist."[76] And because the photographic surface is sensitive to different rays of light than the retina, the photograph could thus visualize that which the naked eye cannot ascertain. As the mechanized, disembodied eye of the photograph furnished Davanne with an example of photography's ability to undertake its own discrete labor, Janssen's claim became the lynchpin in Davanne's argument for photography's autonomy.[77]

Davanne stumbled upon a serendipitous parallel in the École's photographic workshop that would further buttress his quest to valorize the medium. As the director for France's Service des Phares, Reynaud oversaw the preparatory plans for the maps to be reproduced in his publication of an atlas of the ports of France. Since 1868, Huguenin had worked under Reynaud in the photography atelier where he developed these plans by photographically superimposing ordnance, maritime, and urban maps to form a hybrid image produced at the same scale and

[76] On Jules Janssen's use of photography, see Gunthert, "La Rétine du savant. La Fonction heuristique de la photographie"; Françoise Launay, "Jules Janssen et la photographie," in *Dans le champ des étoiles. Les Photographies et le ciel, 1850-2000*, ed. Quentin Bajac (Paris: Réunion des Musées Nationaux, 2000), 22-31; and Monique Sicard, "Passage de Vénus," *Études photographiques* 4 (May 1998): 44-60. Variations on this adage gained currency at the end of the nineteenth century. Edward Eigen attributes a similar axiom to the astronomer George Pouchet. Eigen quotes him as having written in 1886 that photography provided "a different kind of retina than the human eye." Edward Eigen, "Dark Space and the Early Days of Photography as a Medium," *Grey Room* 3 (Spring 2001): 91. Notably, Étienne-Jules Marey developed a similar instrument, the so-called chronophotographic gun in 1882, to photograph human and animal locomotion. Marta Braun, *Picturing Time: The Work of Étienne-Jules Marey, 1830-1904* (Chicago: University of Chicago Press, 1993); and François Dagognet, *Étienne-Jules Marey: A Passion for the Trace*, trans. Robert Galeta with Jeanine Herman (New York: Zone, 1993).

[77] Gunthert, "La Rétine du savant. La Fonction heuristique de la photographie." Davanne also rehearses Janssen's theory in his course at the École, see Davanne, *Conférence sur la photographie*, 2.

projected along the same meridian lines. The École's newly enlarged workshop of the mid-1870s furnished Huguenin with the space needed to fashion a large easel upon which he placed the maps to be photomechanically reproduced (Fig. 4.8). After collapsing together these multiple layers of topographic data, the new map was then engraved.[78] Impressed by Huguenin's technique, Davanne proclaimed that it constituted a "new means of control" by way of photography.[79] Davanne furthermore adopted Huguenin's development as evidence in support of his ongoing crusade to legitimize photography.[80] As Davanne underscored, Huguenin's process synthesized multiple forms of documentation executed at different times and by different hands. Like Janssen's invention, this procedure demonstrated photography's capacity to execute its own discrete work that could not be achieved by other means.

Speaking four years after his appointment to the photographic workshop of the École on the occasion of the Société Française de Photographie's exhibition held at the Palais de l'Industrie of 1876, Davanne likened photography to two other pivotal industrial marvels of the nineteenth century: "As steam, as electricity, [photography] in effect plays, although in the most modest dimension, its part in the progress of all the applications of human knowledge."[81] While André Gunthert notes that these additional inventions are those that made the railroad possible, they were also integral parts of engineering science and training at the École. As part of Davanne's pursuit to promote photography as a scientific enterprise, Davanne repeatedly

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[78] M. Huguenin, "Note sur l'exécution des clichés destinés à la reproduction des cartes géographiques," *Bulletin de la Société française de photographie*, vol. 23 (Paris: Gauthier-Villars, 1877): 215-220.

[79] Davanne, "Rapport sur la XI˚ exposition de la Société française de photographie," 261. For his cartographic photography, the Société Française de Photographie awarded Huguenin a medal on the occasion of its exhibition in 1876.

[80] Louis-Alphonse Davanne, *La Photographie. Traité théorique et pratique* (Paris: Gauthier-Villars, 1886), 90.

[81] Davanne is quoted in Gunthert, "La Rétine du savant," 32.

substantiated his claims by turning to the work of the engineers at the École. In collaboration with his colleagues at the Société Française de Photographie, Davanne was able to make substantial strides in the valorization of photography. As Gunthert argues, by acquiring the support of the Ministère de l'Instruction Publique, securing state funding for the society, and gaining expanded coverage for photography at universal expositions, Davanne had a substantial impact on the more visible public presence of photography as a scientific medium in France in the 1870s and 1880s.[82] As much as photography had itself helped to shape engineering practices on the worksite and at the exhibition hall, engineering would help structure Davanne's assertions about photography.

Davanne's declarations about photography's role as a scientific medium arose concurrently with the engineers' work at universal expositions in the 1870s and 1880s where they assigned photography an important role in their exhibition practices. Given the animated conversations about photography within the walls of the École, it is worth speculating about the impact that Davanne's claims had on their mobilization of photographs for these events. Certainly, Davanne can be written off as neither a superficial nor an irrelevant interloper among engineers. In pragmatic terms, Davanne's criticism of the photographs assembled by Reynaud in 1872 appeared to have spurred Choisy and de Dartein to make significant changes in their selection and arrangement of photographs for display in 1876. Moreover, Davanne's suggestions to enlarge the École's photographic atelier in size and scope was reflected in the larger quarters given over to the operation in the extension of the school's building in the 1870s.[83] In broader

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[82] Gunthert, "La Rétine du savant," 32.

[83] "Mais nous espérons qu'elle prendra une importance beaucoup plus grande, lorsque les travaux de reconstruction permettront à l'École de lui donner une plus large place." Davanne, "Rapport sur la XI° exposition de la Société française de photographie," 261.

terms, public works entered the cultural imagination through photographs at universal expositions and the ways in which these images were constructed materially and discursively impacted their resonance for the viewer. Given that the lion's share of photographs displayed dated from the Second Empire at which time Proudhon spoke of industrial displays in the terms of *richesse*, we might ask: just how did these photographs come to transmit notions of liberal Republican values as they circulated decades after their initial creation in the Second Empire?

As the photographs on display were mostly drawn from Second Empire building campaigns, their shift in meaning can neither be attributed to aesthetic nor stylistic transformations. Rather, their change in signification was the result of a discursive and ideological reframing. Only when photography gained firm associations with scientific models in the 1870s and 1880s would the medium come to reflect the Third Republic's broader adoption of a myth of scientism as a political strategy of republican universalism. As Harry Paul underscores: "No other regime has ever been more committed to science as a source of ideology, the guiding beacon of light, than the Third Republic in the last quarter of the nineteenth-century."[84] Within the nascent "science empire" of late nineteenth-century France, photographs helped to structure the discursive practices of a Republican propaganda of objectivity.[85] However, photographs are not inherently objective. Only when they were constructed as such were they able to act as a scaffold for the political aspirations of the Third Republic government in the period.[86] As the institutional work of Davanne and Société Française de Photographie unfolded through speeches, polemics, and publications, it helped to create a new conception of

[84] Harry Paul, *From Knowledge to Power: The Rise of the Science Empire in France, 1860-1939* (Cambridge: Cambridge University Press, 1985), 38.

[85] Paul, *From Knowledge to Power,* 263.

[86] On objectivity as a social production, see Daston and Galison. *Objectivity*.

photography in the period. Having also influenced the understanding of photography at the École, these engineers acquired a new scientific anchor for the medium, which then structured their use of photography for universal expositions in the name of their profession, the ministry, and the national government. In the process, public works themselves seemed to emerge with greater ideological power upon the ostensibly technical, and then scientific, surface of the photograph.

By the end of the 1880s, photography's scientific potential appeared boundless. Once Davanne left his post at the École at the end of 1885, his colleague at Société Française de Photographie, Lucien Bordet, took charge of the school's conferences on photography in 1886.[87] As the vice-president of the society, it is scarcely surprising that Bordet rehearsed the claims made earlier by Davanne in his courses by apprising engineering students of a dizzying array of recent photographic applications employed within France's scientific community. Bordet put forth examples ranging from Janssen's "photographic revolver" to the ambitious *Cartes du Ciel* project, which was initiated by Paul-Pierre Henry and his brother Mathieu-Prosper Henry to photograph all of the stars in the sky. He also cited the application of the groundbreaking invention of dry plate technologies in the 1870s, which were exploited by Éleuthère Mascart in his photographs of atmospheric electricity and the earth's magnetic field.[88] In addition to providing these examples, which confirmed the scientific orientation of the medium at the end of the 1880s, Bordet also articulated the implications of photography's mounting ubiquity.

Writing in 1887, Bordet communicated the very omnipresence of photography among engineers in particular:

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[87] *Procès-verbaux des séances du conseil*, February 1887, reg. 7, ENPC, 24.

[88] Lucien Bordet, *École des Ponts et Chaussées (1887-1888). Conférences sur la photographie* (Paris: ENPC, 1888), 4.

> In industry, in the art of the engineer, the drawing plays the role of a veritable language; if the hand of man were the only means to carry out all their work, there would be an extremely considerable expenditure of time and money. Photographic procedures permit them to obtain them quickly and to have very many copies at a good price.[89]

While early photography was frequently discussed as a form of drawing, how intriguing it is that Bordet should suggest that photography might now supplant the engineering drawing altogether as a more economic and efficient surrogate--an organizing agent in a technological network. For all of the importance assigned to the medium's scientific capacity in the 1870s and 1880s, photography's conception as a replacement for engineering drawings would carry additional implications. Efforts to valorize photography in France would not only rest on scientific notions about the medium, but they would also trigger its cultural pervasiveness as photographs circulated at an accelerated speed. As a result, the photograph would come to achieve a privileged status as a document of objective rigor in the decades surrounding the twentieth century. The implications of the changing status of photography for engineers working in the field are the subject of the following chapter.

[89] Bordet, *École des Ponts et Chaussées (1887-1888). Conférences sur la photographie*, 4.

CHAPTER 5. THE MEDIATED CITY

In 1892, then Minister of Public Works Jules Viette circulated an official memo in which he announced the new services of the photographic workshop at the École des Ponts et Chaussées then made available to state engineers.[1] While underscoring the benefits of reprographic technologies in general and photomechanical reproduction of drawings in particular, Viette lamented that only large cities contained the necessary facilities and resources to undertake such work. To remedy the situation, Viette declared that the École's photographic workshop would begin to provide reprographic services for engineers working throughout France. As part of the workshop's new mission, the engineer Léon Perronne oversaw the workshop's new mission, which reduced and enlarged photographs and negatives along with large drawings, maps, plans, and other two-dimensional works of art by means of lithography or photolithography for engineers in state service.[2] The minister informed engineers that their orders should be sent directly to the École in a cardboard tube and accompanied by a detailed order indicating the mode of reproduction to be employed, the scale of the reduction to be made, and the number of copies required. To further streamline the process, Viette enclosed two drawings with the memo depicting technical tableaux of a culvert, one reproduced by lithography

[1] Jules Viette, "Circulaire du ministre des travaux publics aux ingénieurs en chef des ponts et chaussées (Personnel, 4e bureau), Paris le 15 décembre 1892," in *Recueil de lois, ordonnances, décrets, réglements et circulaires concernant les différents services du Ministère des travaux publics*, vol. 6 (Paris: Imprimerie Administrative G. Jousset, 1893), 313-315. The expanded services of the photography workshop are also mentioned in Paul Debray, *Exposition universelle international de 1900 à Paris. Rapports du jury international* (Paris: Imprimerie Nationale, 1902), 159-160.

[2] The École's photographic workshop paid for the costs of the reproductions. Viette, "Circulaire du ministre des travaux publics aux ingénieurs en chef des ponts et chaussées," 313. The workshop had already been called upon to photomechanically reproduce drawings for other state agencies. In 1887, for instance, it responded to a ministerial request to reproduce plans of the second and third floors of the Palais Royale for the Ministre de l'Instuction et des Beaux-Arts. *Procès-verbaux des séances du conseil*, February 1887, reg. 7, ENPC, 23. On Léon Perronne's role in managing this aspect of the workshop, see Fernand de Dartein, *Discours prononcé par M. l'inspecteur-général de Dartein, aux obsèques de Léon Perronne, chef des travaux photographiques à l'École des ponts et chaussées, le 20 septembre 1895, à Chailly* (Paris: Impr. de Reullier, 1895).

and another by photolithography (Figs. 5.1 & 5.2). The drawings of the drain illustrate the standards to which engineers were asked to adhere and the scales at which drawings could be reproduced.

Thus, as the state's propaganda campaigns brandishing its public works waned in the 1890s, the workshop shifted its focus to operate as a kind of centralized graphics output laboratory for engineers working in the field. Moreover, Viette's mundane circular evidences photography's increasingly routine and, indeed, banal role in engineering practice as it became a vehicle for proliferating multiple copies in anticipation of the age of xerography. After decades of experimentation with the medium, engineers refined and codified multiple applications of photography for their field as photographic technologies seeped into an ever-widening array of engineering practices. The more pervasive its applications and the more entrenched it became, the more photography seemed to disappear in plain sight as its visual characteristics were absorbed and transformed by other media. Although this chapter will not address the reprographic role of photography in engineering practice at any length, this application serves as a point of entry into understanding the very ubiquity gained by photography in the decades surrounding the turn of the twentieth century and the subsequent decrease in its importance for sustaining the Third Republic's political ideology in the second decade of the twentieth century.

While new photographic technologies such as the handheld camera and halftone printing would help make photography widespread, the changing nature of the public also precipitated the medium's omnipresence in the period. After Haussmann left office in 1870, the municipal government subsequently incorporated new modes of democratic process into its urban planning policies. As part of this effort, the city's Municipal Council, which was elected by universal male suffrage beginning in 1871, gained amplified power in the decision-making processes involved

with urban projects in the capital.[3] Furthermore, the Third Republic's law of the freedom of the press of 29 July 1881 renewed public debate over the municipal government's urban projects. As public opinion became more vocal, Parisians increasingly mediated the choices concerning urban projects in the capital. As a result, these building campaigns, in turn, became increasingly mediated by photographic technologies as a vehicle to communicate to this mass audience. Of course, the process of mediation was never neutral. Reflecting the scientific orientation of photography in the period, the engineers who mobilized photography along with the public spectators who viewed them showed remarkable confidence in the medium as an objective document.

As the work of municipal engineers unfolded within this increasingly mediatized atmosphere where images and ideas circulated with accelerated velocity, their photographic practices grew into an unprecedented range of applications.[4] For these reasons, they, too, became increasingly savvy in their uses of the medium as they crafted and, indeed, manipulated the meaning of urban projects with photography. This chapter will explore the photographic strategies of municipal engineers working in the field within this image-saturated atmosphere by turning to four case studies involving bridge building, restoration, and maintenance in the capital during the decades surrounding the turn of the twentieth century. As municipal engineers

[3] Nagaï, *Les conseillers municipaux de Paris sous la Troisième République*, 12.

[4] I use the term mediatize in the French sense of the word *médiatiser*, meaning to give media coverage. Scholars have attended to the pervasiveness of mass images--photographic and otherwise--in the period in a number of ways. Vanessa Schwartz sees the phenomenon as part of the spectacularization of everyday Parisian life. Vanessa Schwartz, *Spectacular Realities: Early Mass Culture in Fin-de-Siècle Paris* (Berkeley: University of California Press, 1998). Molly Nesbit explores one form of representation that flourished in the period--the document--through her work on the photographer Atget. Nesbit describes the document as follows: "Whether drawn or photographed, the document was playing an increasingly important role in the elaboration of scientific and historical proof. It became a standard way of expressing knowledge; it became a means to knowledge; and it put together pictorial forms of knowledge." Nesbit, *Atget's Seven Albums*, 16. Donald English understands the state's wide adoption of photography in the period as part of a rise in propaganda, which he defines in the most general sense on the term. English, *Political Uses of Photography in the Third French Republic*, *1871-1914*.

integrated photography into bridge building beginning in 1857, these structures continued to be important sites for experimentation with the medium decades later. Yet, while these engineers' photographic practices largely contributed to official publicity in the Second Empire, questions concerning the interrelationship of social and visual mediation loom large in the Third Republic, and serve as the conceptual thread that fastens together the case studies examined in this chapter. Rather than investigate an intertwined series of building campaigns topically as in previous chapters, each case study in this chapter will be examined as a means to isolate specific instances in the surge of photographic applications in the 1890s and 1900s.

The first two case studies return to the already familiar terrain of construction photography. Of course, the directed transmission of construction photographs had arisen as part of Second Empire spectacle; and we have already seen the Third Republic adopt the fallen government's exploitation of images in service of its own political ambitions. Through an examination of the photographs commissioned to document the restoration of the Pont-Neuf, of 1890-91, and the construction of the new Pont Mirabeau, of 1894-1896, I will consider instances in which the gaining sway of the Republican bourgeoisie prompted the engineers of the Service des Ponts et Chaussées to again commission photographs that depicted the step-by-step process of bridge construction. Although these engineers had abandoned the practice in the mid-1860s in preference for commissioning only photographs of completed bridges, they returned to this practice the 1890s. In the case of the Pont-Neuf, the engineers of the Service des Ponts et Chaussées commissioned photographs to document a portion of their restoration of the bridge, which was undertaken after its structure had been compromised. As the bridge's instability led to public outrage against municipal engineers, the Service documented its role in the restoration campaign with photographs to validate its work. In the case of the Pont Mirabeau, the Service

des Ponts et Chaussées commissioned a thorough documentation of the bridge as part of a substantial publicity campaign launched to garner public support for the erection of the crossing in eastern Paris.

The third case study turns to an application of photography employed by the Service Technique de la Voie Publique et de l'Éclairage at the turn of the twentieth century when the engineers of this institution, who were charged with the upkeep of the city's streets, were armed with handheld cameras. I will examine how these engineers exploited this new technology to ultimately suppress the threat of a potential lawsuit against the city by a woman, Suzanne Dravert, who claimed to have fallen on the Pont National in 1903. As the Service Technique adopted photographic documentation of the bridge to deny her claim, I argue the engineers used the medium to mediate lived urban experience in the name of maintaining the city and asserting its modernity.

To conclude the chapter, I will turn to a final case study in which an accident on the Pont de l'Archevêché erupted in an enigmatic, if tragic, convergence of press photographers and municipal engineers in the early twentieth century, which illuminates the challenges posed to the photographic practices of these engineers in the period. In fact, as photography migrated to cultural arenas associated with the mass media, municipal engineers would largely discontinue their use of photography at the beginning of the 1910s, bringing an end to their more than fifty-year experiment with the medium. Taken collectively, the case studies examined in this chapter will reveal the diffusion of the medium, which ultimately sounded the death knell for the state's engineer's photographic applications at the beginning of the second decade of the twentieth century.

The Politics of Paperwork

In 1890, an anonymous cameraman captured a photograph looking down at the base of the third pier of the Pont-Neuf's long branch stretching from the Right Bank to the Quai de l'Horloge on the western tip of the Île de la Cité, which was then in the throws of a massive restoration campaign (Fig. 5.3).[5] The colossal pier sits within a cofferdam set into the Seine that is surrounded by a temporary retaining wall made of blocks of stone and Portland cement to create the watertight platform. Upon this ephemeral stage of timber, stone, and mortar, an engineer leans against the base of the mammoth pier in the center of the photograph, while a group of engineers and workers stand perched to the right atop a fan of timber planks, which were set in place before a steam pump dried out the river's water below. While posing during the photograph's exposure, these figures pause from the task of excavating the foundation's old stones, which they discard into a chaotic pile in the foreground. After mining these stones, the engineers would consolidate the pier's foundation by filling it in with Portland cement.

Yet, this theatrical rendering of the worksite betrays the photograph's putative utilitarian role. The image is one of nine albumen prints in a bound album that illustrates the restoration of the piers and arches along the long branch of the Pont-Neuf executed from 1890 to 1891.[6] These images were not reproduced in the state's propaganda campaigns; rather, the album was

[5] On the long branch of the Pont-Neuf, the six piers count from the île-de-la-Cité to the Right Bank; the abutments are not included in the system of numeration. On the process of restoration, see M. Guiard, "Notice sur les travaux de restauration du Pont-Neuf à Paris," *Annales des Ponts et Chaussées* (1891): 885.

[6] There is conflicting evidence concerning the dates of this final stage of the restoration campaign. In Guiard's article in the *Annales des Ponts et Chaussées*, which is dated October 1889 (and published in 1891), the engineer states that work on the first, second, and third piers of the long branch have been completed and that the fourth and fifth will be completed in 1890. Guiard, "Notice sur les travaux de restauration du Pont-Neuf à Paris," 897-898. However, a letter from the Ministre des Travaux Publics to the Prefect dated August 1890 in the Archives de Paris sanctions the work to commence, see Letter from the Ministre des Travaux Publics to the Prefect of the Seine, 25 August 1890, Archives de Paris, D2S6 16. I therefore adopt the dates given in this letter for the dates of the restoration of the long branch.

deposited into the extensive archive of the École des Ponts et Chaussées in 1891 where it lingered as a visual record of the *travails* of the engineers of the Service des Ponts et Chaussées charged with the bridges of Paris who oversaw the restoration.[7]

For Bruno Latour, the restoration campaign completed in 1891 is but one moment in an episodic history of the bridge's ongoing maintenance after its inauguration by Henri IV in 1607.[8] Latour describes the Pont-Neuf as if it were a veritable living monument whose existence is ensured by the constant renewal of its stones, which he likens to the regenerating cells of the human body. According to Latour, "the living body… differs from a stone bridge only in the pace of its renewal."[9] Nevertheless, he concedes that institutions--not biology--keep the bridge standing:

> The Pont-Neuf rests not only on sound piles firmly secured to the bed of the Seine, but also on another Corps, other administrations: those of the Ponts et Chaussées, of the Monuments Historiques, of the Prefecture. If the rising waters of the Seine no longer lash at its arches, it is because it has always been cautiously wrapped in its guardians' care, in its engineers' calculations… wash drawings, archives, and municipal decrees.[10]

Following Latour's analysis of the bridge, we might append the photographic album illustrating the bridge's restoration to the stack of paperwork assembled as part of the monument's constant upkeep; indeed, photography played such an administrative role when the Service des Ponts et Chaussées first commissioned Collard to photograph the Pont Saint-Michel in 1857. Yet, by the

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[7] Résal gave the album to the École on 21 November 1891, see *Catalogue de photographies anciennes. 1859-1915*, ENPC PH 500.

[8] On the bridge's history, see Fernand de Dartein, *Le Pont-Neuf sur la Seine, à Paris, 1578-1607. Notice descriptive et historique* (Paris: Imprimerie Polytechnique Béranger, 1911); and Jocelyne van Deputte, *Ponts de Paris* (Paris: Editions Sauret, 1994), 114-134.

[9] Latour, *Paris ville invisible*, 98. For Ulf Strohmayer, Latour's discussion of the bridge's rapid renewal further evidences the Pont-Neuf's modernity. Ulf Strohmayer, "Bridges: Different Conditions of Mobile Possibilities," in *Geographies of Mobilities: Practices, Spaces, Subjects*, ed. Tim Cresswell and Peter Merriman (Burlington: Ashgate, 2011), 129.

[10] Latour, *Paris ville invisible*, 99.

mid-1860s, the institution replaced the step-by-step photographic documentation of the construction process with photographs of completed bridges, a practice associated with official propaganda campaigns that the institution continued to employ in the early years of the Third Republic.[11] Since paperwork does not stack up on its own, we might ask just why the Service returned to this practice for the Pont-Neuf's restoration at this time and in this place.[12]

The engineers likely responded to the significant applications of construction photography at the recent universal exposition of 1889 where the medium had been harnessed as a ubiquitous tool to flaunt the technological bravado evident in the buildings erected for the occasion. From the cinematic photographic documentations of the progress of the Eiffel Tower, executed by Pierre Petit or Louis-Emile Durandelle, to the latter's photographs of the Galerie des Machines, such images helped turn these buildings into icons of modern construction before they were even completed. To further grasp why engineers employed photography during the restoration of the Pont-Neuf, it is also worth probing Latour's assumption that the institution operated as a well-oiled machine, which seemed to be able to foresee just which stones required replacement before they ever began to show wear. The restoration work on the Pont-Neuf that terminated in 1891 was only undertaken in the wake of a calamity on the bridge's short branch, which reaches from the Quai des Orfèvres on the Cité to the Left Bank. At around 6:00 AM on the morning of 17 December 1885, a crack appeared on the roadway of the short branch, violently lifting up the pavement of the sidewalks and disjointing the stones on the bridge's road. In the same moment, the second pier closest to the Left Bank began to sag into the river facing

[11] Consider, for example, Collard's photographs of the completed Pont de Grenelle of 1877.

[12] To be sure, the thorough photographic documentation of the construction process did not halt in the practices of other French engineers and architects who also commissioned photographs.

upstream, causing the two adjacent arches to slump as a number of their voussoirs crashed into the water below.[13]

Engineers quickly arrived on site to assess the damage. They initially surmised that the river's forceful current created a wave that crashed against the bridge and caused the damage.[14] After further examining the bridge's foundations, the engineers found that the accident was in fact prompted by the rising water levels of the Seine. Over time, water had eroded a layer of sand below the bedrock, undermining the second pier, which the bedrock supported. As the pier settled, it ultimately sparked the accident.[15]

Rather than completely rebuild the pier and the two arches, Georges Guiard, Jean Choquet, and Paul Rabel, who were charged with the project under the aegis of the Service des Ponts et Chaussées, instead chose to conserve the length of the short branch running downstream and only rebuilt the damaged length of the bridge running upstream.[16] The first phase of the restoration campaign, which involved repairing the second pier damaged in the accident, was the most arduous task and required the use of a caisson filled with compressed air to rebuild the foundation. While this first restoration campaign drew to completion in 1886, the accident also compromised the stability of the other two piers of the short branch, which the engineers rebuilt from May to September 1888.[17]

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[13] De Dartein, *Le Pont-Neuf sur la Seine, à Paris,* 59-60.

[14] "Effondrement du Pont-Neuf," 1.

[15] Guiard, "Notice sur les travaux de restauration du Pont-Neuf à Paris," 885; and A. Depuis, "Nouvelles. Le Pont-Neuf," *La Construction Moderne* (2 January 1886): 144.

[16] As Guiard point out, this decision provided a number of advantages: circulation would not be interrupted, the façade of the bridge running downstream would be preserved, and it would be less costly than reconstructing the entirety of the piers and arches. Guiard, "Notice sur les travaux de restauration du Pont-Neuf à Paris," 886.

[17] The engineer Xavier-Frédéric Lesierre supervised the on-site execution of the work. Guiard, "Notice sur les travaux de restauration du Pont-Neuf à Paris," 897.

The photographic album, however, illustrates the last stage of the bridge's restoration that entailed rebuilding the piers of the Pont-Neuf's long branch. This phase, which was overseen by Rabel from 1890 to 1891, confronted the engineer with a smaller challenge since the foundations were sturdier because they plunged deeper into the riverbed. Although Rabel was thus more confident in this stage of the restoration, the paper trail of archival documentation related to this multi-phase project executed over the course of six years principally deals with this final chapter of the building campaigns.[18] The criticism of the 1880s made it imperative for the administration to produce a complete documentary record. And the engineers of the Service were likely impelled to assemble this documentation during this last phase to substantiate their public accountability by verifying the bridge's stability in a lengthy paper trail.

Indeed, the Pont-Neuf was historically the city's most important bridge. As Mercier wrote a century earlier: "The Pont-Neuf is to the city what the heart is to the human body, the center of movement and circulation."[19] Even though the rest of the bridges of Paris had long since been cleared of the houses built on top of them and opened up to circulation following the model of the Pont-Neuf, the bridge still commanded a privileged position in the life of the city. In fact, it was claimed that the Pont-Neuf was the most crowded thoroughfare in Europe in the 1890s.[20] Given its vital role in the capital, it is hardly surprising that once news spread of the accident by word of mouth on the fateful morning of 17 December 1885, reports of the event quickly became exaggerated and led Parisians to believe that the entire bridge had collapsed.

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[18] The archival documents in the Archives de Paris related to the restoration only deal with this final phase of the work. Archives de Paris, D2S6 16.

[19] "Le Pont-Neuf est dans la ville ce que le coeur est dans le corps humain, le centre du mouvement et de la circulation." Mercier, *Tableaux de Paris*, vol. 1, 81. Mercier is also quoted in van Deputte, *Ponts de Paris*, 4.

[20] "Crowded Streets," *The Phrenological Journal of Science and Health* 92-93 (April 1891): 189.

Even once such rumors were dispelled, Parisians remained disquieted as the accident disproved the French aphorism "*solide comme le Pont-Neuf*."[21]

The damage to the bridge's pier and arches contributed to escalating anxieties over the condition of the city's bridges in the face of two other recent disasters involving the Pont des Invalides and the Pont d'Arcole. In the first case, the Pont des Invalides had a long, unsettling history in Paris beginning with its near collapse in 1827 while still under construction.[22] Although the Service des Ponts et Chaussées had rebuilt the bridge in stone in 1854, it was subject to a firestorm of criticism, lambasting its builders for erecting the structure too carelessly in the hasty preparations for the opening of the universal exposition of 1855.[23] By the 1870s, the bridge's arches began to crack. During the restoration campaign at the end of that decade, a boat had slammed into the bridge, damaging the work site and the temporary timber overpass.[24] However, it was in the winter debacle of 4 January 1880 that the swift current of the river, moving as fast as a "trotting horse," dislodged massive pieces of ice the size of "enormous blocks of stone."[25] As they slammed into the bridge at 4 PM, they took down the new wooden overpass, engulfed the bridge's roadway, and tore off the bridge's parapets. To prevent further destruction, the city subsequently dynamited the ice. Rather than attribute the damage to natural

[21] "Effondrement du Pont-Neuf," 1.

[22] See the introduction to this dissertation concerning the initial debacle of the Pont des Invalides.

[23] Jean Frollo, "Les ponts cassés," *Le Petit Parisien*, 24 May 1880: 1.

[24] van Deputte, *Ponts de Paris*, 192-193.

[25] "La Débacle," *Le Petit Parisien*, 5 January 1880: 2; and Gaston Tissandier, "La Débacle de la Seine, le 4 janvier 1880," *La Nature* 8, n. 340 (1880): 116-118.

disaster, critics assailed the engineers of the Service des Ponts et Chaussées whom they claimed underbuilt the Pont des Invalides in 1854, leaving it vulnerable to future damage.[26]

Furthermore, the Pont d'Arcole began to show signs of collapse on 1 February 1888. At about 1 PM on this snowy afternoon, the bridge emitted a booming sound and its span began to sag in the center. The long iron rods that held the girders in place, which in turn supported the bridge's single wrought iron span, had snapped and caused the span to sink. The event must have substantially rocked the municipal government since two engineers of the Service des Ponts et Chaussées, Guiard and Rabel, met Alphand on the site immediately after the accident transpired.[27] The engineers ultimately surmised that the rods broke either because of contraction created by the cold winter weather or because of an excess of weight from vehicular traffic. Critics again assailed the engineers of the institution who built the bridge from 1855 to 1856 and claimed that they were "seduced by the idea of crossing this beautiful, bold arch" in a single span, but lacked a comprehensive understanding of the resistance of wrought iron in the mid-1850s.[28]

The accidents of the Pont des Invalides, the Pont-Neuf, and the Pont d'Arcole provoked public uproar over the municipal government and the engineers of the Service des Ponts et Chaussées. One critic decried the administration in the daily newspaper *Le Petit Parisien* after the near collapse of the Pont d'Arcole:

> After this accident, one is justly surprised that the Direction of Travaux de Paris has not seriously verified… the security and the state of the roads. It has been some time since the Pont-Neuf was seriously menaced. Yesterday, the Pont d'Arcole fell. These two facts

[26] Frollo, "Les ponts cassés," 1.

[27] "L'Affaissement du pont d'Arcole," *Le Petit Parisien*, 18 February 1888: 2.

[28] Frollo, "Les ponts cassés," 1.

> reveal a distressing negligence, and one has the right to reproach the administration for this carelessness.[29]

Amidst the public outrage triggered by these accidents, the architecture journal *La Construction Moderne* published a letter to the editor penned by the architect Léon Davoust. In the wake of the disaster on the Pont-Neuf, Davoust demanded the publication of documentation detailing the condition of the Pont-Neuf and the circumstances of the accident. In particular, Davoust requested a transparent exposition of prior surveys and calculations undertaken by the Service des Ponts et Chaussées. Furthermore, the architect urged the journal to publish photographs of "the actual state of the rupture of the vaults and the piers of the bridge" to compare with the engineers' calculations. Revealing his unflagging conviction in photography's objectivity, Davoust hoped that the public would be able to study these images to assess the condition of the bridge leading up to the accident to determine its cause.[30]

In response, the journal's founding editor Paul Planat commissioned and published two photographs of the bridge taken after the accident. An unidentified cameraman labored to capture the photographs while the city was submerged in a heavy fog. The first photograph illustrates the western elevation of the bridge's short branch facing downstream (Fig. 5.4). Photographed straight on from a slender dock in the center of the Seine, the bridge's elevation emerges out of the smoky cloud of fog that subsumes the buildings above the bridge on the Cité on the left side of the image. Nevertheless, the photograph shows how the bridge's stones endured and reveals

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[29] "À propos de cet accident, on peut justement s'étonner que la Direction des Travaux de Paris ne vérifie pas d'une façon qui assure sérieusement la sécurité, l'état des voies de communication. Il y a quelques temps le Pont-Neuf était grandement menace. Hier, le Pont d'Arcole s'affaissait. Ces deux faits paraissent trahir une fâcheuse négligence, et on est en droit de reprocher son incurie à l'administration." "Les ponts," *Le Petit Parisien*, 19 February 1888: 2.

[30] "Il me semble qu'il serait intéressant de relever, et cela le plus tôt possible, par une ou plusieurs photographies, ou par tel autre procédé très exact, l'état actuel de la rupture des voûtes et des piles de pont, et de suivre de la même façon la marche de cette rupture, qui ne peut avoir d'autre résultat que le complet effondrement du pont." L. Davoust, "L'Accident du Pont-Neuf," *La Construction Moderne* (26 November 1885): 121.

none of the damage sustained on the other side of the bridge. The second photograph depicts the injured short branch facing upstream from the quay of the Left Bank (Fig. 5.5). Yet, in its austere tranquility, the image betrays the wounds suffered by the bridge. In the image, the parapet running above the two central arches, which had been removed after the accident to alleviate weight on the piers below, has been replaced with a provisional timber guardrail. The damaged second pier closest to the Left Bank has already been surrounded by a temporary platform.

With these photographs, Planat invited his readers to observe the compromised state of the bridge and study the possible causes that brought it about. In explaining his rationale for publishing the photographs, Planat writes: "Our readers have under their eyes a rigorous, factual picture, without any interpretation."[31] In this instance, photography no longer consolidated official claims about urban development from the top down. Challenging Habermas's assertion that the rise of the mass media undermined the critical potential of public debate with its market-based logic, the transmission of these images instead armed this debate with visual evidence.[32] As a result, the publication of the photographs helped to create an informed public, empowering it with renewed agency to participate in an educated debate over the accident.

In the late 1880s, the Service des Ponts et Chaussées began to respond to public criticism of the administration. As a result, the engineers finally undertook a thorough inspection of the city's bridges in May 1888 on the eve of the universal exposition of 1889.[33] As engineers

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[31] "Nos lecteurs ont sous leur yeux le tableau rigoureux du fait, sans aucune interprétation." P. Planat, "L'Accident du Pont-Neuf," *La Construction Moderne* (26 November 1885): 121.

[32] Habermas, *The Structural Transformation of the Public Sphere*, 169.

[33] Frollo, "Les ponts cassés," 1. Furthermore, the Service des Ponts et Chaussées found themselves facing mounting pressures from a number of forces. When work had not commenced over a year after the initial accident on the Pont-Neuf, the city's Municipal Council demanded an explanation in March 1886, see A. Dupuis, "Les travaux du Pont-Neuf" *La Construction Moderne* (20 March 1886): 280. More will be said about the growing influence of the Municipal Council in the next section of this chapter.

became increasingly accountable to the public for their work in the late 1880s, it is little wonder that the Service produced extensive documentation including the step-by-step photographic survey of the last phase of the Pont-Neuf's restoration in these years. Surely, the meticulous recording of their work through photographs, reports, and calculation must have appeared as a pressing matter in order to legitimate their work to the public with a paper trail of visual evidence in which they apparently had complete trust.[34]

Faced with public dissatisfaction over bridge construction and maintenance, photography operated as a privileged vehicle to objectively record the restoration process. As the photographer commissioned by the Service focused his lens on the construction site while stationed on the quays, he aimed his camera downward at the worksite carved into the river. As a result, the compositions of the photographs often appear awkwardly compressed, as if captured within a remarkably narrow field of vision. Consider the first two photographs in the album depicting the simultaneous restoration of the first and second piers of the long branch: the first one illustrates the view downstream and the second one upstream (Figs. 5.6 & 5.7). The images reveal the restoration at the same moment as we saw in the photograph of the third pier, only now the retaining wall and platform wrap around the two piers. In the photographs, which disclose the largest portion of the entire bridge among the images in the album, the span itself recedes at a sharp angle in order to evidence the watertight platform that absorbs the foregrounds of the photographs.

The cameraman reveals the next step in the restoration process by employing a similar composition. Now, the photograph depicts the forth and fifth piers of the bridge, which were consolidated concurrently (Fig. 5.8). While the two piers are also surrounded by a platform, the

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[34] On the archival context of nineteenth-century photography, see Rosalind Krauss, "Photography's Discursive Spaces: Landscape/View," 311-319.

engineers have carved out a vast cavity to build a cofferdam beneath the fifth pier. Into this excavated ditch, the engineers would siphon Portland cement through a porcelain tube to form the pier's new foundation. A throng of engineers and workers populate the platform, while two figures stand inside the fissure below. Above their heads, the boom of a floating bucket crane, whose rotation during the photograph's exposure haunts the image with streaks in the sky, brings stones to the site to rebuild the ones exhumed during the excavation. What is astonishing about these photographs is that they are uniquely dedicated to illustrating the tasks involved with the bridge's restoration. Unlike Collard's earlier photographs of the bridges of Paris, there are neither all-encompassing views of the Pont-Neuf nor images illustrating the bridge after the completion of the restoration campaign. Therefore, we find the cameraman inevitably responding to the particular requirements of the engineers of the Service who, in disregarding the medium's earlier role as a mechanism of official publicity, sought to record the restoration work to evidence their responsibility in repairing the structure.

While the concept of restoration in nineteenth-century France did not necessarily entail the precise recreation of a building according to an earlier state, the engineers were nevertheless held publically accountable for ensuring that their restoration did not alter the Pont-Neuf's appearance as it stood before the accident.[35] As Guiard underscores in his chronicle of the bridge's restoration, "The arrangement of the elevation of the new construction has been reproduced exactly according to the old one." To "mathematically conserve" the former appearance of the bridge, the engineers faced certain challenges since "the piers were not absolutely parallel, the bridge was slightly slanted, and… the various rows of voussoirs were all

[35] As Eugène-Emmanuel Viollet-le-Duc famously extolled in 1854: "To restore an edifice means neither to maintain it, nor to repair it, nor to rebuild it; it means to reestablish it in a finished state, which may in fact never have actually existed at any given time." Eugène-Emmanuel Viollet-le-Duc, "Restoration," in *The Foundations of Architecture: Selections from the Dictionnaire raisonné*, trans. Kenneth D. Whitehead (New York: George Brazillier, 1990), 195. On the desire to recreate the appearance of the bridge before the accident, see Frollo, "Les ponts cassés," 1.

uneven."[36] Consider a photograph illustrating a detail of the fifth pier (Fig. 5.9). As the river's water has been siphoned out of the worksite, the photographer captures an otherwise imperceptible image. Here, the cameraman depicts the collapsing stones at the base of the foundation, which water has eroded over time and turned into debris. Yet, in another photograph of the fifth pier executed after its consolidation, the cameraman zooms out of the details of the former image to reveal the completion of the work (Fig. 5.10). Three engineers stand to the right of the rebuilt base, while another one poses mid-way up a ladder. The rebuilt base rises nearly as high as the figures in its immaculate reconstruction. However, the reconstructed base, which stands newly articulated with its rigid contours, will soon be plunged back into the invisible depths of the river, forever concealing these once visible alterations from plain sight.

By illustrating the restoration of the Pont-Neuf stone by stone, the album of photographs visually records the bridge's repair, and returns us to Latour's claim on the institution's ongoing renewal of the bridge through piles of paperwork. The institution, however, did not begin to record its renewal on its own volition, but it was hastened by the public's gaining influence in the decision-making processes concerning the condition of the capital's urban fabric. And the institution's marked use of paperwork became one means for its engineers to legitimate their new accountability to Parisians. As evidence of the work of the engineers, the photographs of the Pont-Neuf's restoration--both through their production and subsequent classification as archival documents--would ultimately contribute to an internal record of engineering practice as these images languished in archives. Nevertheless, the return of a step-by-step photographic documentation of the construction process among these engineers is also an indication of the diverse applications of the medium in the decades surrounding the twentieth century. Although

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[36] Guiard, "Notice sur les travaux de restauration du Pont-Neuf à Paris," 888.

engineers were increasingly scrutinized through photography, they also gained new popular admiration in the wake of the universal exposition of 1889. As a result, the engineers of this institution continued to commission thorough photographic documentations of their projects. However, their employment of the medium would not only serve as an internal document, but photographs would again contribute to the state's publicity campaigns.

Community Building

On 10 April 1896, a cameraman dispatched from Félix Nadar's studio, which was then under the management of his son Paul, stationed himself above the Quai d'Auteuil (today the Quai Louis Blériot) on the Right Bank to photograph the nearly completed Pont Mirabeau (Fig. 5.11).[37] The steel span, which was then the longest and tallest in the capital, juts over the Seine at a diagonal and nearly traverses the width of the photograph beneath the smokestacks on the Quai de Javel and the Eiffel Tower on the Left Bank. Zooming into the details of the photograph, groups of onlookers gather along the quay on the Right Bank. With their backs to the camera, they focus their attention on the spectacle transpiring on the road of the bridge. Arriving midway across the road from the Left Bank are twelve wagons each led by eight horses and each carrying 16,000 kilograms of stone in a final test of the bridge's stability.[38] On 5 December, the engineers of the Service des Ponts et Chaussées had already tested the bridge with dead weight by setting 800,000 kilograms of sandbags on top of the crossing for a week, and subsequently opened the bridge to pedestrians. After the winter passed, the municipal government redirected river traffic

[37] On Paul Nadar's role in his father's studio, see Ulrich Keller, "Sorting Out Nadar," in *Nadar*, 81-82.

[38] P. Planat, "Nouvelles. Paris. Le pont Mirabeau," *Construction Moderne* 17 (25 April 1896): 360.

along the Seine so that the horse-drawn wagons illustrated in the photograph could trot across the bridge to test its endurance with a moving load in order to open the bridge to vehicular traffic on 25 April 1896.[39]

Nadar's studio, which captured this remarkable experiment of engineering ingenuity, was charged with an exhaustive photographic documentation of the bridge's construction. These images contributed to the veritable media blitz that accompanied the erection of the bridge. The shear scale of this publicity campaign was spurred by new photographic technologies emerging in the 1880s and 1890s including faster shutter speeds and film emulsions, which captured moving objects on the photographic surface; silver gelatin dry plates, which allowed photographers to dispense with cumbersome dark tents and boxes of chemicals; and halftone printing, which provided an inexpensive means to reproduce photographs in print with startling precision. As these new technologies made photographic representations sharper and their circulation more ubiquitous, they helped inscribe the erection of the bridge into an astounding discursive apparatus crafted by the municipal government, which attempted to make the structure meaningful to Parisians.

In the bridge's early planning at the beginning of the 1890s, the municipal government sought to link the bridge to ideologies of progress associated with the liberal politics of the Third Republic government. In fact, the bridge was named after the statesman Honoré Gabriel Riqueti, comte de Mirabeau, who, as a moderate in the Estates-General in Revolutionary France, was resuscitated as a venerated guardian of liberal Republican values.[40] Although the national

[39] On the delay for the second test, see Minister of Public Works to the Prefect of the Seine, 21 February 1896, Archives de Paris, D2S6 28. On the redirection of river traffic for the test, see the poster Préfecture de Police, "Pont Mirabeau. Avis à la marine," 2 April 1896, Archives de Paris, D2S6 28.

[40] In 1876, a statue of Mirabeau had been erected in Aix, see "La statue de Mirabeau," *Le Petit Journal*, 17 December 1876: 2. Another statue was erected in Montargis in 1888, see Jean Frollo, "Mirabeau," *Le Petit Parisien*, 7 August 1888: 1.

government was in the throes of consolidating the polarized factions of the previous two decades as new political ties fastened the left to the monarchist right, the city's Municipal Council, which oversaw the planning phases of the bridge, was comprised of members of the radical left until 1900.[41] At the universal exposition of 1889, iron and steel had become the quintessential markers of an official architectural language of liberal Republican politics and galvanized the language of high technology into a style.[42] Members of the Municipal Council thus wagered on this language, which was articulated by the bridge's designer, Jean-Louis Résal, as an appropriate style to express collective Parisian consciousness.

The Pont Mirabeau arose during an exceptional moment of optimism in the history of modern Paris when modernization was harnessed in the name of shared Parisians values. After the fall of the Second Empire in 1870, the municipal government began to integrate renewed forms of public process into its urban planning policies. Yet, historians frequently point out that while the Third Republic government challenged Haussmann's planning practices, his approach to urban planning essentially survived into the last decades of the nineteenth century.[43] The case of the Pont Mirabeau proves the point; in fact, the bridge was a monumental urban gesture conceived as part of the protracted artery comprised from the successive rues Tolbiac, d'Alésia,

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[41] On the politics of the Municipal Council in the period, see Nagaï, *Les conseillers municipaux de Paris sous la Troisième République*, 12.

[42] On Résal, see MM Colson, Séjourné, and Pigeaud, "Notice sur M. Jean Résal," *Annales des Ponts et Chaussées* 2, no. 9 (1920): 148-168; and his professional dossier, AN F/14/11605. Résal had been stationed in Nantes and was awarded the Legion of Honor in 1886 for his Pont de Barbin over the Erdre River. He was relocated to Paris in 1889 and, after completing the Pont Mirabeau in 1896, he was promoted to engineer in chief of the section of the Service des Ponts et Chaussées charged with the bridges of Paris: a post which he held until 1908. Contemporaneously, Resal penned his methods and research of bridge construction in a series of publication, which became standard textbooks at the École des Ponts et Chaussées in 1893. In 1896, Résal began teaching at the school.

[43] Loyer, *Paris Nineteenth Century. Architecture and Urbanism*, 374 ; and Pierre Pinon, "Paris Après Haussmann. L'Haussmannisation en Province et à l'Étranger," in *Paris-Haussmann*, 205.

de Vouillé, and de la Convention curving along the southern periphery of the Left Bank.[44] As the Rue de la Convention bowed northward toward the Seine, the Pont Mirabeau aligned this *percement* across the river, linking together the Port de Javel on the Left Bank and the Quai d'Auteuil on the Right Bank before it ran northward along Rue Rémusat.[45]

Although this sweeping urban gesture linked the Pont Mirabeau to Haussmann's urban vision, the municipal government distanced the building campaign from this risky political alignment, linking it instead with a shared civic identity associated with the Republican bourgeoisie. Understanding this sleight of hand requires not only taking stock of the bridge's stylistic affinities with the aesthetics of technology but also the larger network of publicity that framed the erection of the bridge. The construction photographs executed by Nadar's studio emerged in concert with the circulation of presentation renderings, posters, pamphlets, and press reports, which turned the bridge's planning and construction into mediatized public events that captivated the popular imagination of Parisians. Rather than returning to these photographs outright, it is worth considering them as part of a systematic application of visual representations in the project's development, which the municipal government transmitted to garner support for the bridge's erection.

Although the Pont Mirabeau contributed to a broader urban planning campaign, its early development first gained support from local advocates in the industrial neighborhood in western Paris where the bridge would come to occupy a commanding position. Since 1877, property owners, industrialists, and shopkeepers in the fifteenth and sixteenth arrondissements had called

[44] Guy Tomel, "Le pont Mirabeau," *Le Figaro*, 14 April 1892: 1.

[45] *Construction Moderne* 9 (27 February 1892): 252.

for a new bridge to improve circulation across the Seine.[46] In particular, the Javel bleach factory located on the Left Bank encumbered the neighborhood with substantial traffic. But to cross the Seine, vehicles had to travel to the Pont de Grenelle to the east or the Pont-au-Jour to the west. In 1877, the municipal government, which had just completed the Pont de Grenelle, found the project too costly.[47] In 1888, 6,500 residents from the fifteenth and sixteenth arrondissements signed a petition asking the city to reconsider the project and the city's Municipal Council would drive the project forward in the early 1890s as part of a larger urban alteration along the Left Bank.[48]

In the Third Republic, the Prefect of the Seine no longer held the influence to approve and push through such building campaigns as in the Second Empire. Rather, the city's Municipal Council played a new role in sanctioning building campaigns in the capital. As part of the project's approval process, the Prefecture of the Seine prepared a public inquiry of *utilité publique* in 1892 once the Municipal Council had committed to the idea of paying for the bridge. While such inquiries date back to the July Monarchy's ordinance of 7 July 1833, they were notoriously abused under Haussmann. In the Third Republic, however, the law was resurrected as an essential means to incorporate public process into the apparatus of urban planning required before the Municipal Council undertook its final vote to authorize the project.

Launched by then Prefect of the Seine Eugène Poubelle and executed by the Ministère des Travaux Publics, the public inquiry used extensive visual documentation to solicit public approval for the project. In the first place, notices announcing the public poll were advertised in

[46] The need for improved circulation in the neighborhood is also underscored in L. Marc, "Le pont Mirabeau, à Paris," *L'Illustration* 106 (2 November 1895): 368.

[47] van Deputte, *Ponts de Paris*, 218.

[48] On the petition, see "Conseil Municipal de Paris. Séance du 15 novembre," *Le Petit Parisien,* 17 November 1888: 2.

the press and posted in the city (Fig. 5.12), which encouraged Parisians to partake in democratic process by weighing in on the project. These announcements invited Parisians to sift through the proposal in the town halls of the fifteenth and sixteenth arrondissements or at the Hôtel de Ville for a month-long period lasting from 28 March to 28 April 1892. There, Parisians were given the opportunity to handle the documents, creating an intimate rapport between the viewer and the proposed project, as they weighed in on four documents including a project brief, a cost estimate, an elevation drawing, and a drawing that demonstrated the scale of the new bridge.[49]

The public inquiry required the engineers of the Service des Ponts et Chaussées--under the auspices of the Ministère des Travaux Publics--to assemble presentation renderings as a means to project an image of the finished building. Résal's early drawings are remarkable because he largely secured the bridge's design on paper--with the exception of its sculptural program--before the project was officially approved. In these drawings, Résal articulated the bridge's startling aesthetic and structural dynamism. The elevation depicts its remarkably slender three-part span, which, composed of steel trusses and topped by a parapet of steel filigree, sweeps across the Seine in profile (Fig. 5.13). The longest, central span of 93 meters rests on two piers with two equidistant branches on either side stretching 32 meters each. The central span is the lightest of the three members and functions as a cantilever weighed down by the heavier arms on either side. The miraculous feat of the bridge's design, however, is evidenced in the second drawing (Fig. 5.14). Here, the span of the Pont Mirabeau is superimposed over the spans of the Pont d'Alma and the Pont d'Auteuil to illustrate the unprecedented height of the new bridge stretching nearly 20 meters above the Seine. Achieved through advances in steel construction, the bridge's exceptional height was a ground-breaking accomplishment for Résal because many

[49] For these documents related to the public inquiry, see Archives de Paris, D2S6 28.

of the city's extant masonry bridges--including the Pont d'Alma--were too low and impeded navigation along the Seine as ships were only becoming taller.

Examined collectively, Résal's drawings codified a social contract between the municipal government and Parisians that exploited visual representation as a means to capture the public's attention and gain the project's approval. In an overture to public accountability, these renderings gave Parisians an assurance that their endorsement of the project would result in the precise translation of the bridge from drawing to building. The project would gain the needed support of Parisians in the public inquiry and the Municipal Council subsequently voted to approve the project on 18 May 1892 according to the precise details of Résal's design.[50] Since the cost of the bridge was shared between the city and the state, then president of the Republic Sadi Carnot decreed the project's approval on 12 January 1893.[51]

The most compelling component of the bridge's publicity emerged once construction commenced in the summer of 1893. Posters were again displayed in public spaces and pamphlets were circulated to publicize the ordinance concerning safety measures undertaken during the construction process.[52] Furthermore, Nadar's studio was called upon to begin a coordinated documentation campaign of the construction process. Although documents do not exist concerning the conditions of the commission, it is likely that Paul Rabel, who oversaw the worksite of the Pont Mirabeau, was involved with the commission since photography had also

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[50] P. Planat, "Nouvelles. Paris. Le pont Mirabeau," *Construction Moderne* 10 (11 Mars 1893): 296. The signatures gained for project in the public inquiry support the project, see Archives de Paris, D2S6 28.

[51] Planat, "Nouvelles. Paris. Le pont Mirabeau," 296.

[52] See the poster and pamphlet, Préfecture de Police, "Pont Mirabeau. Avis à la marine," Archives de Paris, D2S6 28.

been mobilized in the last phase of restoration in the Pont-Neuf (which he also supervised).[53] The photographs of the Pont Mirabeau resulted in a bound album illustrating the sequential steps of the bridge's construction. Unlike Collard's photographic albums dating from the Second Empire that included reproduced albumen prints, the photographs of the Pont Mirabeau were reproduced with new advances in halftone printing. As a result, the thirty-nine photographs that comprise the album are laid out in different formats: some are reproduced on a single page, others are reproduced on a double-page spread, and still other photographs take a smaller format and are reproduced in groups of four on a single page. In addition to the album's stunning layout created by the halftone process, the procedure also permitted the exact reproduction of these photographs in the press. As a consequence of this technology, these photographs of the Pont Mirabeau's construction were disseminated in the press with greater frequency and with astounding visual veracity.

Following long-standing precedents for the photographic documentation of bridge construction, these photographs also illustrate major moments in the construction process. However, photography's technological inadequacies left the labors undertaken beneath the river outside of the frame of the photographs during the early stages of construction. Consider a photograph of 1893 depicting a lengthy horizontal view of the Seine, which, shot from the Right Bank looking eastward, reveals the transformation of the river into a construction site (Fig. 5.15). At this moment, workers have built platforms on the northern and southern extremities of the Seine. In the photograph, an elevated chain stretches across the sky for 80 meters from either

[53] Rabel supervised the worksite with the aid of Amédée-Joseph Alby, and together saw to the execution of Résal's design.

platform to notify ships where to pass during the construction.[54] From these platforms, workers are in the throws of establishing the bridge's masonry foundations. To undertake this task, they have already dug 20 meters beneath the river and inserted an iron caisson filled with compressed air. The traces of this work are registered above the river in iron chimneys, which, as they transport workers and materials to the caisson under the river, stand beneath scaffolding on the platforms (Fig. 5.16). While the chimneys are a minor element of the spectacular photograph, a closely cropped detail of the image showing one of them was reproduced through halftone printing on the cover of the professional engineering journal *Le Génie Civil* on 20 January 1894 to illustrate an article detailing the construction progress of the bridge's foundations.[55] With four chimneys in total, two of them move workers to and from the interior cabin of the caisson below, while the other two are used to bring stones up to the surface, which the workers were excavating from inside the caisson before they poured the cement.

After establishing the foundations, workers next lifted the steel structure into place, which is composed of seven steel trusses. Workers began by connecting together the upper trusses carrying the road and the sidewalks with girders before mounting the lower trusses with struts and X-cross bracing.[56] To attach the trusses to the piers, Résal relied upon techniques in metal construction developed by Dutert and Contamin in their design for the trusses of the Galerie des Machines at the universal exposition of 1889. Following their lead, Résal connected

[54] On the chain, see the poster and pamphlet of the construction ordinance for the bridge. Préfecture de Police, "Ordonnance concernant les mesures de sécurité à observer pendant la durée des travaux de construction du pont Mirabeau," Archives de Paris, D2S6 28.

[55] P. Crépy, "Le pont Mirabeau," *Le Génie Civil* 24, no. 12 (20 January 1894): 1.

[56] Charles Talansier, "Les nouveaux ponts de Paris. Le pont Mirabeau," *Le Génie Civil* 29, no.726 (2 May 1896): 18.

the bridge's trusses to the piers using ball and socket joints, which allow for the expansion and contraction of steel caused by temperature change along with wind, snow, and traffic loads.[57]

Take a photograph illustrating the southern part of the span that has already been lifted in place near the Left Bank (Fig. 5.17). Within the image's infinite network of overlapping latticework, the bridge's upper truss is held in place by a longitudinal girder below. Above, the truss is framed by the rolling scaffolding used to hoist up the member before the workers riveted the span into place. In another photograph illustrating the riveting process (Fig. 5.18), engineers and workers stand at the precipice of a truss high above the river with a horizontal girder above their heads. Although the figures have paused for the photograph, a sea of vertical timber spikes awaits the workers to set the next truss on the timber framing and rivet into place.

Indeed, engineers and workers pose in the dramatic industrial staging created by the components of the construction site much as they did in Collard's bridge photographs of three decades earlier. Yet, the photographer dispatched from Nadar's studio also executed spirited images of workers who perform for the camera, which notably differ from Collard's attempts to track workers in his photographs to ensure managerial control. In one example, a worker places his left arm on the base of the jaw of a mammoth hook facing him (Fig. 5.19). In another photograph, workers climb on an A-frame trestle as if it were a jungle gym: one stands perched in the center of the horizontal beam atop the structure, while another one sits to his right (Fig. 5.20). Such theatrical poses in the album--of which these are only a few examples--are certainly emblematic of the practices for which Nadar's studio was famous. In a political context, these

[57] On Dutert and Contamin's use of ball and socket joints in 1889, see John Stamper, "The Galerie des Machines of the 1889 Paris World's Fair," *Technology and Culture* 30, no. 2 (April 1989): 339; and Marie-Laure Crosnier-Leconte, "La Galerie des machines," in *1889. La Tour Eiffel et L'Exposition Universelle*, ed. Caroline Mathieu (Paris: Editions de la Réunion des Musées Nationaux, 1989), 164-195. Both of these authors clarify that the Galerie des Machines was initially intended to be built of steel, but iron was used instead to save costs.

images of workers on the construction site also carried important ramifications as the working class was gaining a new voice in the early 1890s. As these workers appear empowered in the photographs, they become part of the symbolic language of the bridge and operate within the government's concurrent campaigns towards consolidation and inclusivity, which sought, if only briefly in the 1890s, to incorporate the desires of the working class into its policies.[58]

In fact, the bridge's symbolic meaning was a pressing matter for the municipal government and for the engineers of the Service des Ponts et Chaussées right down to its material. As much as the engineers advocated steel construction for its technical virtue, they also recognized its symbolic potential. When Résal famously wrote of the ways in which steel bridge construction technically superseded earlier stone bridge construction, he also distanced the work of the Service from the Second Empire's bridge campaigns with which stone bridges remained closely associated, implying that the application of the new material functioned in service of a new political agenda.[59] At the time when Résal designed the bridge in 1891, his use of metal construction still participated in then salient claims on the potential of metal construction to elicit political meaning aligned with the liberal values of the Third Republic.[60] Indeed, the photographs of the completed bridge seem to attest to these earlier political claims to which the city's Municipal Council remained sympathetic in the 1890s. In order to capture the protracted length of the completed span, the cameraman shot the photograph at a substantial distance while standing on the quay of the Right Bank (Fig. 5.21). As a result, the water of the Seine carpets the foreground of the photograph and gently envelopes the stones of the quay. Sunken into the

[58] Silverman, *Art Nouveau in Fin-de-Siècle France*, 46-47; and Robert Kaplan, *Forgotten Crisis: The Fin-de-Siècle Crisis of Democracy in France* (Oxford: Berg Publishers, 1995), 2-3. Kaplan argues that the proposed income tax, the *impot sur le revenu*, gave fleeting hope to the working class in the early to mid 1890s before it was rejected by the desires of the haute bourgeoisie in 1898.

otherwise desolate urban landscape of western Paris, the expansive steel bridge leaves a monumental mark on the city.

Yet, when the bridge drew to completion in 1896, the technological aesthetics celebrated in the late 1880s were rapidly falling out of fashion. In the 1890s, the national government's new moderate stance brought about the demise of the liberal left as its was envisioned by the first generation of Third Republican politicians. In the wake of the changing political atmosphere, the national government began to sponsor artisanal craft production, which would trigger a stylistic drift away from the technological language of the late 1880s towards the Art Nouveau as evidenced in the universal exposition of 1890.[61] As the members of the city's Municipal Council remained to the left in this decade, we find a curious act of ideological negotiation unfold through the bridge's sculptural program, which the city approved on 28 December 1894, nearly a year after construction began on the project.[62]

The sculptor Jean-Antoine Injalbert designed four allegorical figures in cast bronze, which are anchored on either side of the two piers facing north and south. Photographs of each

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[59] Résal wrote: "Tous les ponts en pierre de Paris constituent des barrières qui gênent la navigation au point de vue du débarquement des marchandises; les petites voûtes de communication ménagées quelquefois pour le halage sont loin d'être équivalents aux larges baies que l'emploi du métal permet de réaliser." Resal is quoted in Bertrand Lemoine, "Les Ponts de Paris," 198. Résal statement further evidences the veritable Oedipal complex that marked sequential generations of engineers working for the Service des Ponts et Chaussées in the nineteenth century, who, in their quest to improve upon bridge construction, condemned the work of their predecessors.

[60] See, for instance, the final article by F. de Villenoisy in a series of three on iron architecture in which the Pont Mirabeau is illustrated as an example. F. de Villenoisy, "Architecture en fer et l'école française contemporaine," *Revue des arts décoratifs* (1895): 321-331

[61] Silverman has shown that the moderate Third Republic government of the 1890s ignited the official sponsorship of a "craft modern style" that will lead to the flowering of the Art Nouveau in France. However, her claim that the aesthetics of technology disappeared as a result of the state's new promotion of artisanal crafts is tempered by the municipal engineers' adoption of steel bridge construction. While the Pont Mirabeau is the first example of steel bridge construction in Paris, it spawned a group of steel bridges that were erected in the capital in the two decades surrounding the twentieth century. However, the Pont Alexandre III build on the occasion of the universal exposition of 1900, which Silverman analyzes, shares the closest stylistic affinities with the Rococo revival associated with French Art Nouveau. Silverman, *Art Nouveau in Fin-de-Siècle France*, 169-171

[62] "Dossier: Décorations sculpturale des piles, 1894," Archives de Paris, D2S6 28.

sculpture were taken after they were set in place in May 1896 as part of the album's exhaustive detailing of the bridge's decoration. In these photographs, the four sumptuous maidens, which are executed in the round, each sit on the prow of a ship. Abundance blows the horn held in her extended left arm (Fig. 5.22). Navigation turns her back to the Seine as she guides sailors with the torch in her right arm extended over her head (Fig. 5.23). The City of Paris holds a *francisque* in her left hand (Fig. 5.24). And Commerce turns her back as she steers a boat by its mast (Fig. 5.25). The photographs of the bold figures record the sinuous, curving lines of their bodies, which echo the Rococo revival then underway as part of the new style. However, the iconography grasped in their hands fiercely displays their confidence in the purportedly prosperous nation and its capital, communicating messages generalized enough that they could speak to both the liberal politics of the Municipal Council and the new, moderate political agenda of the national government.

Furthermore, the photographs of the bridge's decoration also document the Third Republic's newly sanctioned heraldry, which is emblazoned on either side of the parapet above the sculptures and stamps the national political program onto the bridge (Fig. 5.26).[63] Each cartouche depicts a boat sailing on stormy waters, which is symbolic, as Debora Silverman argues, of the Third Republic's resiliency in the 1890s. Reflecting the government's renewed monarchical sympathies, fleur-de-lis mark the sky above the ship topped by a crown.[64] Neither the sculptures nor the cartouches were part of Résal's original design of the bridge. In light of their later addition, and given the fact that the cost of the bridge was shared by the municipal and the national governments, it is scarcely surprising that the bridge's iconography would negotiate

[63] Notably, this heraldry was not part of Résal's design for the bridge in 1892.

[64] Although Silverman does not note its presence on the bridge, she provides a superb analysis of the heraldry, see Silverman, *Art Nouveau in Fin-de-Siècle France*, 44-45. On the heraldry, also see Ferguson, *Paris as Revolution: Writing the Nineteenth-Century City*, 115-117.

the changing political climate. Certainly, by the time that they were displayed at the universal exposition of 1900, these photographs, which incorporate the seal of moderate Republicanism, would speak not only to the nation, but also to the Municipal Council, which then oscillated to the right.[65]

Even in the face of such political tensions, the Pont Mirabeau established an internationally acclaimed model for steel bridge construction, and the engineers of the Service des Ponts et Chaussées would go on to build additional steel bridges in the capital including the Pont Alexandre III of 1897-1900, the Passerelle de Magdebourg of 1899-1900 (renamed the Passerelle Debilly in 1906), the Viaduc d'Austerlitz of 1903-1904, and the Viaduc de Passy of 1903-1905 (renamed the Pont de Bir-Hakeim in 1949).[66] As part of these building campaigns, engineers would continue to commission photographic documentation to publicize these bridges. During this time, they would increasingly exploit photography's capacity to structure reception. With the concurrent rise of other photographic technologies such as the handheld camera, other municipal engineers would develop alternative applications of the medium that extended beyond the construction site as they incorporated photography into bridge maintenance and structured how the city was experienced by the individual rather than by the collective.

The "Dravert Affair"

"One's body takes root in the asphalt."[67]

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[65] Debray, *Exposition universelle international de 1900 à Paris. Rapports du jury international*, 110

[66] The first three of these bridges were erected on the occasion of the universal exposition of 1900.

[67] Siegfried Kracauer, *The Mass Ornament: Weimar Essays*, trans. Thomas Levin (Cambridge: Harvard University Press, 1995), 332.

On Sunday 4 January 1903, Madame Suzanne Dravert traversed the Pont National with her daughter and future son-in-law.[68] While crossing the bridge, which spans the Seine at the edge of eastern Paris, Madame Dravert tripped over a crack in the pavement of the bridge's sidewalk and sprained her leg--or so she claimed. Immediately following the accident, her daughter called upon a police officer for assistance and the three escorts accompanied Madame Dravert to a nearby police post at the Porte de Bercy on the Right Bank. Upon their arrival, her daughter flagged down a carriage to take her mother back home to Ménilmontant in the twentieth arrondissement. Madame Dravert paid the fare. The accident led to several skin infections, leaving her sedentary and unable to work over two months later. She subsequently sent a letter dated 24 March to then Prefect of the Seine, Justin Germain Casimir de Selves, in which she threatened to retain a lawyer and take legal action if the city did not compensate her for the harm caused by what she called a "dangerous hole" in the pavement of the bridge.

In order to assess the validity of Madame Dravert's claim, the Prefect asked the Service Technique de la Voie Publique et de l'Éclairage to examine the case.[69] This municipal institution had replaced the former Service du Pavé in 1859 as part of Haussmann's vast overhaul of municipal institutions responsible for building during his tenure as Prefect of the Seine in the Second Empire. Haussmann's reconfiguration of the municipal administration not only formalized institutional channels for the modern urban transformation of Paris, it also galvanized

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[68] The following account comes from the file "Affaire Dravert," VONC 340, Archives de Paris. The Pont National was the first bridge to be built in the Second Empire. It was first named the Pont Napoléon III and renamed the Pont National after the fall of the Second Empire. On the construction of this bridge in particular, see Romany, "Notice historique sur les ponts de Paris," 188-189.

[69] "Affaire Dravert," VONC 340, Archives de Paris. In the period, the Prefecture of the Seine was above the Prefecture of Police. Georges Lechalas, *Manuel de droit administratif. Services des ponts et chaussées et des chemins vicinaux* (Paris: Baudry, 1889), 227.

the services for urban upkeep as part of the city's vast institutional machinery that remained in place long after the Prefect left his post in office. In addition to street paving, the Service Technique de la Voie Publique et de l'Éclairage also inherited many of the responsibilities previously assigned to the Prefecture of Police including street lighting and cleaning that were associated with the maintenance of the capital's visible surfaces.[70] Engineers of the Service Technique subsequently launched a minor investigation into the accident. Having dubbed their inquiry the "Dravert Affair," they scrutinized the case as if it were a police investigation by assembling witness testimony and inspecting the scene of the accident. As part of their examination, they took two site photographs of the hole in the bridge's pavement with a handheld camera. Ultimately, the engineers would exploit the images as visual evidence of the city's perpetual physical integrity, insisting that the hole was too insignificant to cause any harm.

Once Paris assumed its form as a quintessentially modern city at the turn of the twentieth century, its physical appearance was maintained by municipal services and its modernity was continually formulated through an ongoing interplay of authoritarian regimes, cultural practices, and everyday experiences. Based on a file in the Municipal Archives of Paris detailing the investigation into Madame Dravert's complaint, the following pages probe the cultural anxieties that surfaced when desires to sustain Paris's enduring mythology and claims on modernity collided with corporeal experience, eliciting questions about the nature of urban public space and its users at the turn of the twentieth century. As part of this story, the engineers employed photography as an entrenched technology of engineering practice and for its supposed objective rigor, which mediated and, ultimately, undermined Madame Dravert's subjective experience on the bridge's pavement.

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[70] The Service Technique de la Voie Publique et de l'Éclairage was created when the city's surrounding communes were annexed to the capital in 1859. On the institutional organization of the institution, see de Pontich, *Administration de la ville de Paris et du département de la Seine*, 331-332.

Before turning to the photographs taken by these engineers, it is worth chronicling the investigation in the course of which they were executed. To begin, the engineers contacted officer Vialy who accompanied Madame Dravert from the site of her fall to the police post.[71] The engineers asked Vialy to take them to the Pont National and show them the "dangerous hole." Once at the site, Vialy pointed to what the engineers later called "a small crack" in the pavement situated above the bridge's first pier near the Right Bank. The fissure located at the site initially corroborated Madame Dravert's story.

The engineers continued with their investigation by summoning Madame Dravert herself to their office. On 8 April, her daughter arrived in her place, explaining that her mother still could not walk. When her daughter recounted the events of 4 January to the engineers, there were significant discrepancies from what the engineers witnessed on site. She explained that the fissure was about 8 to 10 centimeters deep and located, not above the bridge's first pier, but in the center of the crossing. The engineers requested that she accompany them back to the bridge and show them this larger hole. Having returned to the bridge, Madame Dravert's daughter located this other crack in the center of the bridge in which pavement was missing. In the middle of the cleavage was a pebble upon which, she explained, her mother had tripped. She noted that someone must have since filled in the hole with dirt since it had been much deeper at the time of her mother's fall: "8 to 10 centimeters" she reiterated. The engineers then brought her to see the other fissure that officer Vialy had previously indicated. She insisted, however, that it was most certainly the hole in the center of the bridge that caused her mother's fall. The engineers thus examined the hole presented by Madame Dravert's daughter and they noted that the pebble was

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[71] For the sake of narrative clarity, I refer to the two engineers who undertook the inquiry as "the engineers." The engineer of the Service Technique de la Voie Publique et de l'Éclairage Guéret was charged with the investigation and executed the photographs considered below. He was assisted by his colleague from the same institution, Lemaitre.

"about the size of a nut" and nothing more than a protrusion of the mortar from the bridge's foundation.

With the inconsistencies over the location of the hole in the pavement, the engineers decided to contact another witness: Madame Dravert's future son-in-law, Pierre Lalut. On 14 April, the engineers paid Lalut a visit at his place of business at the department store La Samaritaine. "The hole," Lalut explained to the engineers, "was elongated and deep." To give an idea of its depth, Lalut approximated its size to the length of his hand and forearm: "15 to 20 centimeters" he said.[72] Moreover, Lalut told the engineers that the fissure was located on the bridge near the Quai de Bercy facing the Right Bank. As the engineers listened to Lalut corroborate the story of the police officer rather than the one of his fiancé, they subsequently asked him to comment on the protruding pebble within the hole on which Madame Dravert supposedly tripped. "It was more like a cut in the masonry than a pebble" he responded. Before the engineers left La Samaritaine, Lalut added that Madame Dravert had sent another letter about fifteen days before the one received by the engineers dated 24 March. Because she did not receive a response, Lalut had spoken to his friends' lawyer who counseled him that Madame Dravert should send another letter threatening to obtain private counsel.

The engineers subsequently sent Madame Dravert a letter dated 17 April, which requested her presence on site so she could point out the hole herself. Because Madame Dravert was still under doctor's orders to remain sedentary, her daughter again appeared in her place on 20 April with a doctor's note in hand. Her daughter immediately apologized to the engineers, stating that she had mistakenly pointed out the incorrect hole in her previous meeting with them. She conceded that it was not the crack in the center of the bridge that caused the accident, but rather the one indicated by her fiancé and the police officer that was closer to the Right Bank. Having

[72] "Affaire Dravert," VONC 340, Archives de Paris.

mutually agreed upon the hole in question, the engineers subsequently took two photographs of the hole on the Pont National.

In their first photograph (Fig. 5.27), the sidewalk runs out from under the feet of the engineer holding the camera. The pavement recedes in a straight line into the image's vanishing point, which is obstructed by two blurred figures walking towards the engineers. To the right of the composition, the other engineer leans against the cut-stone railing of the bridge wearing a long black overcoat. His face is cropped out of the picture. As with the two murky silhouettes in the background, the identification of the figure was not the photograph's objective. The engineers were there to photograph the hole. While the foreground of the image is largely emptied out to focalize its subject, the hole is hardly noticeable; rather, it appears as a shallow impression in the paving. A measuring stick pricking the depression conveys its dimensions of 0.40 millimeters long, 0.18 millimeters wide, and between 0 to 0.27 millimeters deep.

In a second photograph taken by the engineers (Fig. 5.28), the sidewalk is captured from the same camera angle. The couple from the first photograph has since walked past the scene, and they have been replaced by a single figure. The other engineer still lingers over the hole; only now he has moved to the left of the composition with his hand in the pocket of his overcoat. The right side of his body and his head are cropped out of the image. The distribution of figures across the composition now reveals the dynamic linear recession of the bridge's parapet, which frames the right side of the composition. In the foreground, the hole appears larger that in the first photograph as the engineers have unearthed the loose dirt filling the crack. The engineers verified the maximum possible depth of the emptied hole with the same instrument at 0.35 millimeters. Registering the difference between a fraction of a millimeter, these mundane records

of this banal urban blemish operated as documentary proof in these engineers' ultimate suppression of Madame Dravert's claim.

The engineers forwarded the dossier of the Dravert Affair including miscellaneous correspondence, the engineers' report, and the photographs to a higher-ranking engineer. While the engineers charged with the investigation had undertaken their inquiry in earnest, his superior rendered his decision governing Madame Dravert's complaint with an authoritarian deportment. Having reviewed the dossier, the engineer found that the testimonies of the witnesses were inconclusive. Specifically, he noted that there were inconsistencies in their stories, that the letter had arrived too late to properly inspect the site as it existed at the time of the accident, and that there were no proper eyewitnesses since Madame Dravert's daughter and her fiancé walked in front of her at the time of her fall. Having swept aside what he saw as inconclusive testimonies, the engineer found the photographic evidence more convincing. The higher official accepted the measurement as initially recorded on site and verified by the first photograph. After explaining that a depression in the pavement of 0.27 millimeters did not constitute a "dangerous hole," he further stated:

> There is certainly no city, burg, or village without a gradient of 0.27 millimeters within the gentle slope of the pavement… In our opinion, not only is the Pont National not in a poor state, its maintenance rivals that of certain areas in the center of Paris and the city could not have a more perfect appearance.[73]

Privileging the immediacy of the visual evidence, the engineer carefully scrutinized the material reality of the site and assigned it a conspicuous role in his decision. For the engineer, the millimeters of the city's crevices, the compactness of its infill, and its "perfect appearance"

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[73] "Il n'existe certainement aucune Ville, aucun Bourg ou Village ne présentant pas de dénivellation de m 0.27 raccordée en pente douce… À notre avis, non seulement le pont National n'est pas en mauvais état de viabilité, mais il peut rivaliser comme entretien avec certains quartiers du centre de Paris et la Ville ne peut-être tenue à plus grande perfection de sa visibilité." "Affaire Dravert," VONC 340, Archives de Paris.

provided resolute evidence against Madame Dravert's claim. Indeed, her slip on the pavement of the bridge and injury became a matter of contestation as her complaint challenged claims on the city's physical integrity. Yet, not only did the engineer conclude that the city was not culpable in the matter, but he further suggested that Madame Dravert was "hardly sensible on 4 January" for her own actions and thus at fault herself. Further probing Madame Dravert's intentions, the engineer questioned her public comportment while disregarding her private reality, ridiculing her as a veritable hysteric: "Perhaps even while slipping on an orange peal, she thought of a 'dangerous hole' as a means to garner compensation from the city of Paris."[74] With the engineer's letter, Madame Dravert's claim against the city was resolutely denied.

It is surely unremarkable that an engineer trained in the hard and applied sciences should lean on empirical evidence to render his decision and, for that matter, the photographs that operated within the objective claims so often made on the medium in the period. By 1903, photographs had long been familiar documents among civil engineers in municipal service. After George Eastman had perfected his handheld rolled-film Kodak camera in the late 1880s, French engineers subsequently began to equip themselves with the device in the late 1890s and did not always depend on having cameramen accompany them on site (Fig. 5.29).[75] However, the purported objectivity of these photographs was not only hastened by the photographic images, but by how they were fashioned. Affixed to paper, labeled submittal "A" and submittal "B," marked up with the conditions of the site, and stamped with ink from the desks of the engineers who had examined and signed off on them, these images were further worked up as

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[74] "Peut-être même a-t-elle simplement glissé sur une pelure d'orange et n'a-t-elle pensé au 'trou dangereux' que pour se faire dédommager par le Ville de Paris." "Affaire Dravert," VONC 340, Archives de Paris.

[75] On the merits of the use of the handheld camera among French civil engineers, see G.H. Niewenglowski, "Leçons élementaires de photographie practique. La photographie instantanée," *L'Ingénieur civil* 5, no. 105 (15 August 1896): 2095-2096.

administrative documents. The fact that they hold remarkably similarities to contemporary police reports only further demonstrates their presumed status as objective documents.[76]

Given the evidence gathered by the engineers charged with the investigation, we cannot verify the events of the 4 January 1903 on the Pont National. From hindsight, we may nevertheless ask why they did not obtain more conclusive evidence? For, if the engineers travelled to the Pont National in eastern Paris and even to La Samaritaine in the city center, why did they not visit the sedentary Madame Dravert in Ménilmontant to gain the testimony of the alleged victim? Indeed, Madame Dravert's grievance first sparked an inquiry into her injury. Yet, by demanding that the city account for her personal experience, her claim contested then salient notions about urban public space and its stewardship, which conventionally operated on behalf of the collective rather than the individual. Certainly, in her demand for compensation, she placed her own desires before her role as a citizen and her attachment to the body politic, thus creating a breach--even if for valid cause--in notions about public space as a shared arena. At the same time, Madame Dravert's petition reflected then salient assumptions about the quality of the city's pavement, an expectation that only developed in the nineteenth century when the metropolis's streets and sidewalks became thoroughly paved as a response to mounting demands for urban health, cleanliness, and unencumbered circulation.[77] It is therefore scarcely surprising that the engineers interpreted her claim, which privileged the individual over the collective, as a volatile threat against the city itself. Indeed, they were accustomed to conceptualizing and maintaining

[76] On the privileged status of the document in the period, see Nesbit, *Atget's Seven Albums*, 16. In addition, it is worth comparing the photographs taken by the engineers to contemporaneous police photography developed by Alphonse Bertillon, see Alphonse Bertillon, *La Photographie judiciaire* (Paris: Gauthier-Villars et fils, 1890); and Pierre Piazza, ed. *Aux origins de la police Scientifique. Alphonse Bertillon, précurseur de la science du crime* (Paris: Kathala Éditions, 2011).

[77] On the history of the city's pavement, see Rodolphe el-Khoury, "Polish and Deodorize: Paving the City in Late-Eighteenth-Century France," *Assemblage* 31 (1996): 6-15; Jeffrey Schnapp, "Three Pieces of Asphalt," *Grey Room* 11 (Spring 2003): 5-21; and de Pontich, *Administration de la ville de Paris et du département de la Seine*, 322-351.

urban public space, not as a place of embodied, subjective experience, but as a one to be organized for the congregation and benefit of a collective, faceless public.

As the engineers conflated the maintenance of metropolis with the safeguarding of public space, they also upheld the capital as an arena of masculine experience. Even if the city afforded sites for the construction of female identity such as the department store and the cinema, women played a marginalized role in modern Paris. As Janet Wolff has argued, Parisian public space reflected a particularly masculine construction of modernity at the turn of the twentieth century with "the fleeting, ephemeral, impersonal nature of encounters in the urban environment" in which women were relegated into the stereotypical roles of "the prostitute, the old lady, the lesbian, the murder victim, [or the] passing unknown woman."[78] By illuminating the individual experience of a woman in her petition against the city, Madame Dravert threatened to destabilize the gender norms of the modern city--an anxiety that was made apparent in the misogynistic overtones of the higher engineer's letter as he dismissed her claim outright. In the process, she became inscribed within a pile of paperwork.

As photography had become an entrenched technology of engineering practice at the turn of the twentieth century, it not only infused the ways in which state engineers helped build and maintain modern Paris, but it also mediated the ways in which the city was both perceived and encountered in novel ways. Regardless of whether her claim was factual or fictitious, the decision to deny it was colored by the presumed optical factuality of the photographs and by the

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[78] Janet Wolff, "The Invisible Flâneuse: Women and the Literature of Modernity," *Theory, Culture, and Society* 2, no. 3 (1985): 42. Griselda Pollock also took up Wolff's ideas. See Griselda Pollock, "Modernity and the Spaces of Femininity," in *Vision and Difference: Femininity, Feminism, and the Histories of Art* (New York: Routledge, 1988), 50-90. More recently, Wolff has argued for the necessity of "exploring women's (and men's) actual lives in the modern city." See Janet Wolff "Gender and the Haunting of Cities," in *The Invisible Flâneuse? Gender, Public Space, and Visual Culture in Nineteenth Century Paris*, ed. Aruna D'Souza and Tom McDonough (Manchester: Manchester University Press, 2006), 25.

legitimacy conferred by the administrative marks impressed upon them.[79] Yet, the image that the engineer adopted as proof of the city's physical endurance may have very well betrayed the bridge's condition on the day of Madame Dravert's accident. Treated as documents, which circulated through the official channels of the municipal government's bureaucracy, they exercised authority over Madame Dravert and her complaint. In the process, the engineers manipulated the meaning of the photographs as evidence of the condition of the bridge to help assert a mythology of the city's material durability and perpetual modernity while disregarding embodied urban experience.

If the paper photographs were at the heart of the decision to deny Madame Dravert's claim, the novel idea of documenting the site was precipitated by the emergence of the handheld camera. While the use of the camera among the engineers of the Service Technique de la Voie Publique et de l'Éclairage reveals the prompt saturation of photographic technologies into the institution's mechanisms for urban maintenance, the rapid invention and obsolescence of photographic technologies, as we shall see, carried perilous consequences for the broader photographic practices of municipal engineers. In the first decade of the twentieth century, a new historical actor--the press photographer--would steer photography in a new cultural direction.

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[79] While many historians and theorists have understood the rise of early photography as part of an effort in the development of bourgeois, and then popular, self-representation and expression, others have understood the medium's subsequent development in the later nineteenth century as a mechanism for ordering the human subjects of modern society on a mass scale. In the case of early photography as an example of bourgeois and popular self-representation, see Freund, *Photographie et société*; and Roland Barthes, *Camera Lucida*, trans. Richard Howard (New York: Hill and Wang, 1981). In the case of photography as a mechanism of social ordering, see Alan Sekula, "The Body and the Archive," *October* 39 (Winter 1986): 3-64; John Tagg, *The Burden of Representation: Essays on Photographies and Histories* (Minneapolis: University of Minnesota Press: 1988); and Georges Didi-Huberman, *Invention of Hysteria: Charcot and the Photographic Iconography of the Salpêtrière*, trans. Alisa Hartz (Cambridge: MIT Press, 2003). Jonathan Crary, while not dealing with photography by example, should also be included here, see Jonathan Crary, *Techniques of the Observer*. Linking together this second tendency is an association between photography and Michel Foucault's notion of a "technology of power" (although Foucault does not deal with photography as such), see Michel Foucault, *Discipline and Punish: The Birth of the Prison*, trans. Alan Sheridan (New York: Vintage Books, 1979), 29. While I find that the circumstances of this investigation and the use of photography in it merit such an interpretation, one must make these associations on a case-by-case basis; therefore, it would be incorrect to apply this reading to other photographic practices of municipal engineers.

The Plunge

At 4:40 PM on Wednesday 27 September 1911, a bus carrying twenty-six passengers violently veered off course on the Pont de l'Archevêché, which spans the Left Bank to the Île de la Cité.[80] While making a wide right turn onto the bridge from the Quai de la Tournelle, the bus's driver was too late in catching a glimpse of another bus barreling down the bridge in the other direction. Fearful of colliding with the other bus, the driver quickly swerved his wheel and veered onto the bridge's sidewalk, crashing through the bridge's iron parapet before plunging into the Seine below as screams of "We are doomed!" were sounded from inside the vehicle. [81] Only one person escaped the bus before it fell by swiftly climbing out of an open window and grabbing onto the bridge's parapet.

As the bus sank into the river, a priest onboard, Antoine Richard, quickly clamored to free himself, and subsequently saved five other passengers. Among the victims he was unable to rescue was his friend with whom he was returning from a visit to the Jardin des Plantes. Another man, Eugène Méneveux, who saw the accident transpire, immediately jumped into the river and pulled bodies out of the bus as shards of broken glass from the bus's window cut his hands and feet. Remaining in the water, he then tied the bus with ropes provided by firemen, and he threw the ropes up to them on the bridge. They knotted the ropes to the bridge's parapet and attempted

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[80] For accounts of the accident, see "Un Autobus plein de voyageurs est tombé dans la Seine hier, du haut du pont de l'Archevêché," *Le Petit Journal*, 28 September 1911: 1-2; "Un autobus tombe dans la Seine du haut du pont de l'Archevêché," *Le Petit Parisien,* 28 September 1911: 1-2; "Terrible accident au pont de l'Archevêché," *Le Gaulois*, 28 September 1911: 1; "Un Autobus dans la Seine," *Le Figaro*, 28 September 1911: 1-2. The accident is also discussed in van Deputte, *Ponts de Paris*, 68.

[81] "Un autobus tombe dans la Seine du haut du pont de l'Archevêché," 2

to lift the bus out of the river by manpower. Unsuccessful in their efforts, they waited for a crane to lift the bus out of the river. In the meantime, a throng had assembled on the scene including firemen, doctors, the Prefect of the Seine, the Prefect of Police as well as members of the Municipal Council. They remained on the site until after nightfall. With the aid of a spot light and with torches in hand, they continued to search for bodies in the water until it became too dark to discern the mayhem in the murky river. Accounts of the damage slightly differ; nine to ten people were killed and ten to eleven others were injured.

In the chaos of the late afternoon, a new kind of professional actor also appeared on the scene: not to aid in the rescue effort, but to document the fateful accident with calculated distance. As early as a half-hour after the calamity transpired, press photographers, whose profession had emerged over the previous decade in France, joined the pandemonium to capture images of the disaster.[82] Photographers were dispatched directly from daily newspapers such as *Le Petit Parisien* and *Le Petit Journal* as well as from the press agency, the Agence Rôle. Their photographs immediately appeared in the press the next morning. As readers were confronted with images of the broken bridge as well as corpses and heroic saviors, newspaper reports also tried to make sense of the accident (Fig. 5.30). Was the bus driver who drowned in the river--distraught by the recent death of his wife--to blame? Or, were municipal engineers--who had left the bridge poorly paved, with an unstable parapet, and with poor visibility due to a urinal placed

[82] In the first decade of the twentieth century, press photographers had emerged as a profession in France in response to the developments of the handheld camera and, especially, halftone printing. The latter facilitated the inexpensive reproduction on photographs. While advances in the process had developed in the early 1880s, the French press was slow to incorporate the technique. While photographs did appear in the French press in the 1880s and 1890s thanks to this process, its use only became widespread in France in the first decade of the twentieth century, see English, *Political Uses of Photography in the Third French Republic*, *1871-1914*, 4; and Gisèle Freund, *Photographie et société*, 101-105. In addition to the development of the press photographer, L'Union Photographique Française, which operated from 1898-1912, undertook systematic photographs of the city and its building campaigns on behalf on the municipal government, see Jean-Philippe Dumas, *Paris la rue, un autre 1900. Les fonds de l'Union photographique française aux Archives de Paris* (Paris: Direction des affaires culturelles, 2000).

on the corner of the bridge's street--culpable in the accident? For journalists, who dubbed the bridge "*le pont fatal*," the latter account seemed more plausible. As reports underscored, it had been scarcely six months since a taxi had veered off course on the same bridge, plunging into the Seine on 16 January 1911. Indeed, members of the city's Municipal Council had already demanded that changes be made to the bridge to account for the realities of vehicular traffic.[83] As press accounts multiplied and followed the repairs of the bridge, they supplied an infinite stream of photographs depicting the condition of the crossing, leaving no need for municipal engineers to document the state of the bridge.[84]

As its technological development made it more accessible and as it became embraced by the press, photography was no longer the unique purview of advanced scientific knowledge and procedure as it had been in the nineteenth century. In fact, the medium's changing status had not gone unnoticed by civil engineers in state service. Indeed, these engineers had stopped commissioning photographs of public works for the state's propaganda campaigns in the first decade of the twentieth century. Scarcely four years before the catastrophe of September 1911, the administration of the École des Ponts et Chaussées began debating the relevance of photographic instruction for state engineers, underscoring that photography had become so popularized that the school should perhaps eliminate this "parasitic instruction" altogether.[85] In the same year, the École's archives stopped accumulating photographs.[86] At the very moment when photography became part of a broader visual culture and involved in a popular construction

[83] "Un Autobus plein de voyageurs est tombé dans la Seine hier, du haut du pont de l'Archevêché," 2.

[84] The weight of press photographers and journalists had already been felt in the previous year concerning repairs to be made in the wake of the destruction wrought on the city by the Seine's flooding, see Jeffrey Jackson, *Paris Under Water: How the City of Light Survived the Great Flood of 1910* (New York: Palgrave Macmillan, 2010), 207.

[85] *Procès-verbaux des séances du conseil*, July 1907, reg. 9, ENPC, 265.

[86] This is also pointed out by Baillargeon, see Baillargeon, "Témoignages de rivalité industrielle. La France et les photographies de grands travaux d'origine étrangère," 42.

of the modern city thanks to new photographic technologies, it concomitantly lost its role as a studied object of engineering science. In a perverse act of historical fate, it was in October 1911, nearly a month after the disastrous plunge on the Pont de l'Archevêché, when the school's administration finally removed courses on photography from the École's curriculum.[87]

As the photographic applications of municipal engineers splintered at the beginning of the twentieth century, they would eventually disintegrate almost entirely. For the engineers, photography remained beneficial after 1911, not for visualizing their work as it had for at least the previous fifty years, but rather for its reprographic capacities as discussed at the beginning of this chapter. In fact, the disappearance of photography's material traces in plain sight mirrored the fading of the visual traces of engineers' work more generally. To understand this shift, we should first recall that, in the nineteenth century, municipal engineers were deeply involved in crafting the visible surfaces of the city. On the broadest level, their uses of the medium frequently operated to valorize this aspect of their work as they circulated images of public works in the state's publicity campaigns. As much as this study has dealt with a particular disciplinary paradigm in the second half of the nineteenth century that was hastened at mid-century by the mounting pressures of industrialization, a new disciplinary transformation was underway at the turn of the twentieth century, although it had been recognizable for quite some time.

In the nineteenth century, French state engineers also devoted an enormous amount of their energy developing invisible infrastructural networks and this aspect of the their work only mounted as the twentieth century progressed. As a result, engineers increasingly assumed the

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[87] *Procès-verbaux des séances du conseil*, October 1911, reg. 9, ENPC, 108. Yet, the school did not fully dismantle its photographic workshop and it continued to provide reprographic services on behalf of engineers in state service.

roles of managers, both in public administration and private industry. And, a major part of that work, particularly in the interwar period, would be devoted to developing the country's new network for the distribution of electricity.[88] In the first decade of the twentieth century, the École had already turned to teaching electricity as the new technological and scientific agent of social and political change. As part of this process, engineers assumed an even more diffuse role as the "controllers of the distribution of [electric] energy."[89] Surely, as engineers moved from one disciplinary paradigm to the next and from one network to another, they disassembled the institutional structures for producing and circulating photographs as they recalibrated the instruments and technologies of their profession in the name of progress, leaving behind photography and its institutional scaffolding as obsolete artifacts.

[88] Chatzis and Ribell, "L'Espace des carrières des ingénieurs de l'équipement dans le public et le privé (1800-2000)," 660.

[89] *Procès-verbaux des séances du conseil*, November 1912, reg. 9, ENPC, 172.

CONCLUSION

In 1980, Reyner Banham published a review article dealing with a recent spate of books on bridge building in the *Journal of the Society of Architectural Historians* under the title "*Voyeurs des Ponts et Chaussées*."[1] Among the last of the first generation of historians of modern architecture, Banham was also intensely seduced--as his title plainly indicates--by the technological daring of engineering structures, an allure that is hardly surprising given Banham's training as an engineer. Although Banham confessed to his pleasure for observing the sensuous performance of soaring spans and projecting vaults, we might nevertheless ask why he reduced his ogling to the clandestine gaze of a peeping tom as conveyed by his provocative title. In fact, Banham conjured the word "*voyeur*" to address the architecture community's peculiar intrigue with bridges and bridge-builders: "Perhaps it is because bridge technology used to be part of the complete body of architecture, but slipped out the back of our theoretical treatises around 1800… [that] we feel a special sense of loss." Banham argued that this disciplinary estrangement triggered a sense of a longing and turned architects into "'*voyeurs des ponts et chaussées*' in the absence of a more constructive involvement with this noble art."[2]

Banham's voyeuristic impulse contributes to architects' long-standing romance with engineers that emerged as a result of this mythical disciplinary rift. A century earlier, the architecture critic César Daly had established the terms of this engagement on the occasion of a banquet celebrating the conclusion of a weeklong meeting of the Congrès National des Architectes Français held in Paris from 11 to 16 June 1877. Among this group of architects, the critic raised his glass to toast the engineer: "I am happy to have been invited to give a speech to

[1] Reyner Banham, "*Voyeurs des ponts et chaussées*," *Journal of the Society of Architectural Historians* 39, no. 2 (May 1980): 152-153.

[2] Banham, "*Voyeurs des ponts et chaussées*," 152.

affirm the numerous lines that today increasingly attach architects to their cousins the engineers.“[3] Moreover, Daly underscored the joint contribution made by the two professions to the “the art of building” as well as their common lineage rooted in “the same great family, the family of builders.”

Daly was hardly alone in his effort to bridge the professional divide that often polarized architect and engineer. Indeed, Viollet-le-Duc made similar claims.[4] Yet, Daly’s speech had a particular agenda.[5] Daly concluded his toast by arguing that the engineer, immersed in science and industry, was to aid in the development of what he called “our new and forthcoming *organic architecture*.”[6] Thus, Daly conjured the Saint-Simonian dream of the arrival of an organic moment of cultural renewal and envisioned, as did Saint Simon himself, that the engineer was to play an important role in that utopian aspiration. With this declaration, Daly also established the terms of a potent polemic that would gain new currency in the first decades of the twentieth century, albeit in a more radical form, when engineering acquired a central role in the imagination of the modernist architect--a notion that Le Corbusier famously promoted with his “engineer’s aesthetic.”[7] Yet, Le Corbusier advised that architects could in fact improve upon this

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[3] “Je suis heureux d’avoir été invite à prendre ce soir la parole pour affirmer les liens nombreux qui tendent à rattacher de plus en plus aujourd’hui les architectes à leurs cousins les ingénieurs.” César Daly, “Ingénieurs et architectes,” *Revue générale de l’architecture et des travaux publics* 4 (1877): 160.

[4] Eugène-Emmanuel Viollet-le-Duc, *How to Build a House*, trans. Benjamin Bucknall (London: Sampson Low, Marston, Searle, and Rivington, 1876), 224-227.

[5] Peter Collins points out that Daly first lamented the polarized relationship between architects and engineers in the preface to the first issue of the periodical which he edited, the *Revue générale de l’architecture et des travaux publics* of 1840. Peter Collins, *Changing Ideals in Modern Architecture: 1750-1950* (Montreal: McGill-Queens University Press, 1965), 190. For discussions about the professional divide between architects and engineers in nineteenth-century France, see Hélène Lipstadt, “Early Architectural Periodicals,” in *The Beaux-Arts and Nineteenth-Century Architecture*, 50-57; and Andrew Saint, *Architect and Engineer: A Study in Sibling Rivalry* (New Haven: Yale University Press, 2008).

[6] “…notre nouvelle et prochaine *architecture organique*.” Italics are Daly’s. Daly, “Ingénieurs et architectes,” 162.

aesthetic, thus suggesting a deficiency in the work of engineers. As a result, such positioning of engineering did little more than thematize the engineer in an effort to reify the course of technocentric modernist architecture.[8]

In the tradition established by Daly in the nineteenth century, Banham along with Sigfried Giedion, Henry Russell-Hitchcock, and Peter Collins grappled with engineering as a means to unearth the prehistory of modernist architecture.[9] Part of this effort involved a significant engagement with photographs of engineering structures, particularly in the case of Banham and Giedion. Banham traced the origins of photographs of American of grain silos and factories, which Walter Gropius published in the *Jahrbuch des Deutschen Werkbundes* of 1913 and which Le Corbusier also reproduced (while also retouching them) in the pages of *Vers une architecture* exactly a decade later.[10] If Banham unravelled the historical lineage of these images to understand their meaning as it mutated through their circulation in different times and places, Giedion did not provide such an even-handed assessment of engineering photography. Consider the latter's polemical use of photography in his *Space, Time, and Architecture: The Growth of a New Tradition* of 1941. Here, Giedion was not concerned with the historical circumstances of the production and transmission of these photographs. Instead, he engaged such images in dramatic formal juxtapositions in the pages of his book where, for example, the bases of the colossal iron

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[7] Of course, Le Corbusier would make this claim the most ardently. Jean-Louis Cohen notes that Le Corbusier's interest in engineering also derives from earlier German studies, notably Hermann Muthesius's 1902 *Stilarchitektur und Baukunst* and Joseph August Lux's 1910 *Ingenieurästhetik*. Jean-Louis Cohen, "Introduction" in Le Corbusier, *Toward an Architecture*, trans. John Goodman (Los Angeles: Getty Research Institute, 2007), 6.

[8] It is scarcely surprising that engineers were immediately suspicious of such claims. De Dartein in fact responded to Daly's toast, writing that "on énumère les personnages de marque, on publie toasts et discours; cependant les ingénieurs restent anonymes." De Dartein, *M. Léonce Reynaud, sa vie et ses œuvres*, 245-246.

[9] Collins, *Changing Ideals in Modern Architecture: 1750-1950*; Sigfied Giedion, *Space, Time, and Architecture: The Growth of a New Tradition*. 5th Edition. (Cambridge: Harvard University Press, 2008); Henry-Russell Hitchcock, *Modern Architecture: Romanticism and Reintegration* (New York: Payson and Clarke, 1929).

[10] Reyner Banham, *A Concrete Atlantis: US Industrial Buildings and European Modern Architecture* (Cambridge: MIT Press, 1986), 11.

arches of Dutert and Contamin's Galerie des Machines at the 1889 Universal Exposition dance next to a ballerina by Edgar Degas. Giedion exploited this pairing to evidence the ways that "construction is unconsciously moving toward aesthetic feelings which did not find their equivalents in art and architecture until decades later."[11] In other words, these images underpinned the historian's quest to evidence and direct the ongoing evolution of modernist architecture. If by different means and to different ends, Banham and Giedion nevertheless both understood engineering and engineering photographs as part of the unfinished business of modernist architecture.

By leaving aside the modernist genealogy of engineering photography and mapping its role in the cultural and ideological framework of the second half of the nineteenth century, I have sought to recuperate the historical connections between the photographic practices of state civil engineers and modernity's sweeping social, economic, and political transformations in the period. While historians of photography have also reframed engineering photographs within the historical context in which they were produced and transmitted, I have argued that such an effort not only requires analyzing these images according to the photographers who shot them, but also through the lens of their patronage and the desires of the engineers who commissioned them. If visual representation has proven to be a central and enduring component of building since the Renaissance, the ongoing relationship between buildings and media has been anything but static.[12] And by reassessing these images in the context of their patronage, it has not been my

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[11] Sigfied Giedion, *Space, Time, and Architecture: The Growth of a New Tradition*, 273.

[12] Bletter underscores the currency of visual representation in architecture since the Renaissance. See Bletter, "Representing Architecture: The Drawing and the Photograph," 7. On the Renaissance architectural treatise as media, see Mario Carpo, *Architecture in the Age of Printing: Orality, Writing, Typography, and Printed Images in the History of Architectural Theory* (Cambridge: MIT Press, 2001). On additional uses of representation among architects, see James Ackerman, *Origins, Imitation, Conventions: Representation in the Visual Arts* (Cambridge: MIT Press, 2002); Robin Evans, *The Projective Cast: Architecture and its Three Geometries* (Cambridge: MIT

principal focus to render them as discrete documents that solely belong to the isolated milieu of civil engineers. Rather, I have sought to recuperate their historical status in the second half of the nineteenth century to gauge engineering's migration into popular consciousness through their circulation.

Within this historical context, it is worth returning to Banham's notion of "voyeurs des ponts et chausses" as it carries implications--although ones unintended by Banham--for thinking about the photographic practices of French engineers in relationship to the capital's modernity. Having coordinated the fabrication and circulation of photographs of public works, engineers trained at the École des Ponts et Chaussées helped to create "voyeurs des ponts et chausses" within society at large. This phenomenon initially emerged out of two interrelated phenomena spurred by Paris's speculative building boom of the 1850s. First, the state's engineers adopted photography as a new kind of engineering document that arose with the promise of increased managerial control over the worksite and contributed to the paperwork of the bureaucratic system in which engineers operated. Second, these photographs immediately circulated among broader audiences and propelled the aesthetics of industry and bureaucracy into Second Empire spectacle.

By making public works legible within this political theater of images, engineers established a potent strategy for conceptualizing their building campaigns to the public by means of photography. As this strategy outlived the Second Empire, the photographic practices of engineers continued to serve as a powerful tool of changing state ideologies. By the 1870s,

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Press, 2000); Neil Levine, *Modern Architecture: Representation and Reality* (New Haven: Yale University Press, 2010); and Dalibor Vesely, *Architecture in the Age of Divided Representation: The Question of Creativity in the Shadow of Production* (Cambridge: MIT Press, 2004).

engineers trained at the École became gradually involved in the circulation of the photographs to broader audiences. As a result, they increasingly structured urban experience through a virtual account of the modern city. This account often sought to diffuse the social upheavals that resulted from urban modernization, and it was predicated on a deterministic belief in technology and progress. Once photography became an overwhelmingly popular medium associated with the press, largely with the aid of new photographic technologies at the turn of the twentieth century, engineers subsequently abandoned their earlier interest in it. Nevertheless, they ultimately made photography a generative medium for the construction of the metropolis that tethered the public to the very conception of the modern city.

Photographs commissioned by the state's engineers depicted and publicized material changes made to the metropolis in stone, steel, and Portland cement; they visualized ephemeral alterations made during the construction process assembled from falsework frames, timber overpasses, and cofferdams; and they illustrated new spaces of the capital created by urban modernization such as the sewers and distant water sources. Photographs commissioned by engineers not only rendered these subjects with astonishing veracity, but they also did so with startling immediacy. Therefore, while engineers often conceived of photography as part of a chain of documents employed in the more protracted processes of engineering practice, these images became fetishized for their representational quality as engineers structured their reception at sites for official state culture. As a result, the city's permanent and ephemeral revisions crystalized upon the photographic surface and helped to make modernity more visible.

It is worth dwelling on this particular relationship between the photographs considered in this study and their role in modernity more broadly. The city's modernity has been principally understood as Charles Baudelaire conceived of it in his pivotal essay "The Painter of Modern

Life" of 1859 in which he wrotes: "By 'modernity' I mean the ephemeral, the fugitive, the contingent, the half of art whose other half is the eternal and the immutable."[13] Here, Baudelaire saw Paris's ephemerality as being inexorably linked with its enduring nature, thus developing a binary concept of modernity that also resonates with Marxist conceptions of the subject, as Marshal Berman has underscored.[14] Following this logic, Harvey has understood Paris as a quintessential embodiment of a myth of modernity, which "constitutes a radical break with the past" and is infused with "a certain persuasive and pervasive power in the face of abundant evidence that it does not, and cannot, possibly occur."[15] Certainly, photographs have been understood as part of the evanescent and permanent qualities of modernity that contributed the capital's spectacularization. In this study, I have furthermore suggested that engineering photography in fact contributed to building this myth of modernity. To do so, the photographic practices of the engineers of the Ponts et Chaussées unified new technologies, spaces, institutions, and publics, which contributed to the creation of the image-saturated and perceptually layered arenas of the capital in which its modernity was constructed.

The ordering of the city through a systematic mobilization of photographs was coextensive with the material changes to the metropolis precipitated by the very infrastructure illustrated in the images themselves. To clarify this point, it is worth considering Victor Fournel's claim about the creation of the dome of the Tribunal de Commerce on the Île de la Cité built by Antoine-Nicolas Louis Bailly in 1866: "One day… the Prefect [Haussmann] had seen a photograph of the dome of the city hall of Brescia; he is charmed by this little fragment; he calls

[13] Charles Baudelaire, *The Painter of Modern Life and Other Essays*, trans. Jonathan Mayne (London: Phaidon Press, 1995), 13.

[14] Marshal Berman, *All That is Solid Melts into Air: The Experience of Modernity* (New York: Verso, 1983), 89.

[15] Harvey, *Paris, Capital of Modernity*, 1.

his architect and orders him to affix it to his plan."[16] While Fournel's anecdote does not address the uses of photography among the state's engineers, it points to the emerging permeability between images and buildings that fundamentally affected how the city materialized, a permeability that would gain stronger traction over the course of the ensuing century. And yet, for the state's civil engineers, they would lay Paris's physical infrastructure, which provided the channels to support the circulation of people and goods through the city, while simultaneously erecting a visual network in which they engaged photography as an agent to stabilize and order the ways that the city and its infrastructure were conceived, encountered, and, eventually, understood.

The emerging equivalencies between urban circulation and the transmission of images at once allowed for the dispersal of people over large, often-disparate territories while also bringing them closer together. If these spatio-temporal tensions have been understood as a primary result of infrastructure more broadly, the circulation of images was part of the development of this historical phenomenon. As a result, the orchestration of the built environment into an urban system--at least as it was conceived beginning in the nineteenth century--was indissoluble from visual mediation. While it is often assumed that urban systems have evolved from the weighty materiality of hard infrastructure such as railroad tracks, bridges, pipes to more ephemeral technologies such as electricity and the telephone, the evanescent networks of photographs laid by the state's engineers reveal that the ephemeral nature of infrastructure was present much earlier. As engineers concurrently built the metropolis as a material space and as a virtual one,

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[16] "Un jour, je suppose, M. le préfet a vu une photographie représentant le dôme de l'hôtel de ville de Brescia: il est charmé de ce petit morceau; il appelle l'architecte et lui ordonne de l'adjoindre à son plan." Victor Fournel, *Paris nouveau et Paris future* (Paris: Jacques Lecoffre, 1865), 175.

their visually dense system of image production and circulation provides a conceptual ground for understanding the modern city's construction through an endless stream of images.

BIBILIOGRAHY

ARCHIVAL SOURCES

Archives de Paris, Paris, France
Archives nationales, Paris, France
Bibliothèque historique de la ville de Paris, Paris, France
Bibliothèque nationale de France, Paris, France
École National des Ponts et Chaussées, Marne-la-Valée, France
International Institute of Social History, Amsterdam, The Netherlands

SERIALS

Annales des Ponts et Chaussées
Bulletin de la Société française de photographie
Bulletin de la société géologique
La Construction Moderne
Encyclopédie d'architecture
L'Exposition universelle de 1878 illustrée
Le Figaro
Le Gaulois
Gazette des beaux-arts
L'Illustration
L'Ingénieur civil
Journal of the Association of Engineering Societies
La Lumiere
La Nature
Nouvelles Annales de la Construction
Le Petit Journal
Le Petit Parisien
The Phrenological Journal of Science and Health
Revue des arts décoratifs
Revue générale de l'architecture et des travaux publics
Revue Scientifique de la France et de l'étranger
Les Temps
L'Union Médicale

PRIMARY AND SECONDARY SOURCES

Ackerman, James. *Origins, Imitation, Conventions: Representation in the Visual Arts*. Cambridge: MIT Press, 2002.

Agamben, Giorgio. *Stanzas: Word and Phantasm in Western Culture*. Translated by Ronald Martinez. Minneapolis: University of Minnesota Press, 1993.

Alberti, Leon Battista. *On the Art of Building in Ten Books*. Translated by Joseph Rykwert et al. Cambridge: MIT Press, 1988.

Albright, Ann Cooper. *Traces of Light: Absence and Presence in the Work of Loïe Fuller*. Middletown: Wesleyan University Press, 2007.

Alder, Ken. *Engineering the Revolution: Arms and Enlightenment in France, 1763-1815*. Princeton: Princeton University Press, 1997.

Alexandre, Arnaud, ed. *La Seine et Paris*. Paris: Action artistique de la Ville de Paris, 2000.

Anderson, R.D. *France, 1870-1914: Politics and Society*. London: Routledge, 1977.

Arago, François. "Rapport à la Chambre des deputes." In *La Photographie en France. Textes et controverses. Une Anthologie, 1816-1871*, edited by André Rouillé, 36-43. Paris: Macula, 1989.

Armstrong, Carol and Catherine de Zegher, eds. *Ocean Flowers: Impressions from Nature*. New Haven: Yale Center for British Art, 2004.

_____. *Scenes in a Library: Reading the Photograph in the Book, 1843-1875*. Cambridge: MIT Press, 1998.

Armstrong, Christopher Drew. *Julien-David Leroy and the Making of Architectural History*. New York: Routledge, 2012.

Aucoc, Léon. *Conférences sur l'administration et le droit administratif*. Paris: Dudon, 1869.

Backouche, Isabelle. "From Parisian River to National Waterway: The Social Function of the Seine, 1750-1850." In *Rivers in History: Perspectives on Waterways in Europe and North America*, edited by Christof Mauch and Thomas Zeller, 26-40. Pittsburgh: University of Pittsburgh Press, 2008.

_____. *La Trace du Fleuve. La Seine et Paris (1750-1850)*. Paris: Éditions de l'École des Hautes Études en Sciences Sociales, 2000.

Bacot, Jean-Pierre. *La Presse illustrée au XIXe siècle. Une histoire oubliée*. Limoges: Presses Universitaire de Limoges, 2005.

Baillargeon, Claude. "Construction Photography and the Rhetoric of Fundraising: The Maison Durandelle Sacré-Coeur Commission." *Visual Resources* 27, no. 2 (June 2011): 113-128.

_____. "Religious Fervor and Photographic Propoganda: Durandelle's Anatomical Studies of the Sacré-Coeur de Montmartre." PhD diss., University of California, Santa Barbara, 2002.

_____. “Témoignages de rivalité industrielle. La France et les photographies de grands travaux d’origine étrangère.” *Études photographiques* 17 (November 2005): 16-43.

_____. “Vattemare and the Transatlantic Dissemination of Photographic Practice.” In *The Extravagant Ambassador: The True Story of Alexandre Vattemare, the French Ventriloquist Who Changed the World*, edited by Earle Havens and Pierre-Alain Tillette, 206-215. Paris: Passage, 2007.

Balzac, Honoré de. *The Village Rector* [1841]. Translated by Katherine Prescott Wormeley. Whitefish: Kessinger Publishing, 2004.

Banham, Reyner. *A Concrete Atlantis: US Industrial Buildings and European Modern Architecture*. Cambridge: MIT Press, 1986.

_____. *Theory and Design in the First Machine Age*. London: The Architectural Press, 1960.

_____. “Voyeurs des ponts et chausses.” *Journal of the Society of Architectural Historians* 39, no. 2 (May 1980): 152-153.

Bann, Stephen. “Historical Text and Historical Object: The Poetics of the Musée de Cluny.” *History and Theory* 17, no. 3 (October 1978): 251-266.

_____. *Parallel Lines: Printmakers, Painters, and Photographers in Nineteenth-Century France.* New Haven: Yale University Press, 2001.

_____. “‘When I was a Photographer’: Nadar and History.” *History and Theory* 48 (December 2009): 95-111.

Barberie, Peter. “Conventional Pictures: Charles Marville in the Bois de Boulogne.” PhD diss., Princeton University, 2007.

Barrell, John. *The Dark Side of the Landscape: The Rural Poor in English Painting, 1730-1840*. Cambridge: Cambridge University Press, 1984.

Barthes, Roland. *Camera Lucida*. Translated by Richard Howard. New York: Hill and Wang, 1981.

Batchen, Geoffrey. *Forget me not: Photography and Remembrance*. Princeton: Princeton Architectural Press, 2006.

Baudelaire, Charles. *The Painter of Modern Life and Other Essays*. Translated by Jonathan Mayne. London: Phaidon Press, 1995.

Belgrand, Eugène. *Historique de service des eaux, depuis l’année 1854 jusqu’à l’année 1874*. Paris: Dunod, 1875.

_____. *La Seine. Le bassin parisien aux âges antéhistoriques*. 2 vols. Second Edition. Paris: Imprimerie Nationale, 1883.

_____. *Les Travaux souterrains de Paris*. 4 vols. Paris: Dunod, 1875-1882.

Belhoste, Bruno. *La formation d'une technocratie. L'École polytechnique et ses élèves de la Révolution au Second Empire*. Paris: Belin, 2003.

_____ and Konstantinos Chatzis. "From Technical Corps to Technocratic Power: French State Engineers and their Professional and Cultural Universe in the First Half of the 19th Century." *History and Technology* 23, no. 3 (September 2007): 209-225.

Bell, Claudia and John Lyall. *The Accelerated Sublime: Landscape, Tourism, and Identity*. Westport: Praeger, 2001.

Bell, David. *The Cult of the Nation in France: Inventing Nationalism, 1680-1800*. Cambridge: Harvard University Press, 2001.

Bellet, Roger. *Presse et journalisme sous le Second Empire*. Paris: Armand Colin, 1967.

Bennett, Tony. *The Birth of the Museum: History, Theory, Politics*. New York: Routledge, 1995.

Benjamin, Walter. *The Arcades Project*. Translated by Howard Eiland and Kevin McLaughlin. Cambridge: Harvard University Press, 1999.

Bergdoll, Barry. "Félix Duban, Early Photography, Architecture, and the Circulation of Images." In *The Built Surface: Architecture and the Pictorial Arts from Romanticism to the Twenty-First Century*. Vol. 2, edited by Christy Anderson and Karen Koehler, 1-30. Aldershot: Ashgate, 2002.

_____. *Léon Vaudoyer: Historicism in the Age of Industry*. Cambridge: MIT Press, 1994.

Bergius, Burkhard. "Temporary Illusions." *Daidalos* 6 (December 1982): 63-75.

Berman, Marshal. *All That is Solid Melts into Air: The Experience of Modernity*. New York: Verso, 1983.

Bermingham, Ann. *Landscape and Ideology: The English Rustic Tradition, 1740-1860*. Berkeley: University of California Press, 1986.

Bertillon, Alphonse. *La Photographie judiciaire*. Paris: Gauthier-Villars et fils, 1890.

Blanchère, Henri de la. *L'Art de la photographie comprenant les procédés complets sur papier et sur glace négatifs et positives*. Paris: Amyot, 1859.

Bletter, Rosemarie Haag. "On Martin Frölich's Gottfried Semper." *Oppositions* 4 (October 1974): 146-153.

_____. "Representing Architecture: The Drawing and the Photograph." *Architecture California* 14, no. 1 (May 1992): 6-11.

Bois, Yves-Alain. "Metamorphosis of Axonometry." *Daidalos* 1 (1981): 41-58.

_____. "A Picturesque Stroll around Clara-Clara." *October* 29 (Summer 1984): 34.

Bordet, Lucien. *École des Ponts et Chaussées (1887-1888). Conférences sur la photographie*. Paris: ENPC, 1888.

Boyer, M. Christine. "*La Mission Héliographique*: Architectural Photography, Collective Memory and the Patrimony of France, 1851." In *Picturing Place: Photography and the Geographical Imagination*, edited by Joan M. Schwartz and James R. Ryan, 21-54. New York: I.B. Taurus, 2003.

Boyer, Marjorie. *Medieval French Bridges: A History*. Cambridge: The Medieval Academy of America, 1976.

Braun, Marta. *Picturing Time: The Work of Étienne-Jules Marey, 1830-1904*. Chicago: University of Chicago Press, 1993.

Bressani, Martin and Peter Sealy. "The Opera Disseminated: Charles Garnier's Le Nouvel Opéra." In *Art and the Photographic Album*, ed. Stephen Bann, 195-219. New Haven: Yale University Press, 2012.

Brunot, André and Roger Coquand. *Le Corps des ponts et chausses*. Paris: Éditions du Centre national de la recherche scientifique, 1982.

Brown, Julie. *Making Culture Visible: Photography and its Display at Industrial Fairs, International Exhibitions and Institutional Exhibitions in the United States, 1847-1900*. London: Routledge, 2001.

Bruyère, Louis. *Études relatives à l'art des constructions*. 2 vols. Paris: Bance Ainé, 1823-1828.

Carpo, Mario. *The Alphabet and the Algorithm*. Cambridge: MIT Press, 2011.

_____. *Architecture in the Age of Printing: Orality, Writing, Typography, and Printed Images in the History of Architectural Theory*. Cambridge: MIT Press, 2001.

Cars, Jean de. *Haussmann, la gloire du Second Empire*. Paris: Librairie academique Perrin, 1978.

_____ and Pierre Pinon, eds. *Paris-Haussmann*. Paris: Picard, 1991.

Casselle, Pierre. “Le Conseil Municipal et la reconstruction de l’Hôtel de Ville, 1871-1890.” In *Livre du centenaire de la reconstruction de l’Hôtel de Ville, 1882-1982*, 17-24. Paris: Bibliothèque administrative, 1982.

Cerdà, Ildefons. *Teoría General de la Urbanización*. Madrid: Torija, 1867.

Charleville Raucourt, Antoine de. *Mémoire sur les experiences lithographiques faites à l’École royale des ponts et chaussées de France*. Toulon: Aurel, 1819.

Chevalier, Louis. *La Formation de la population parisienne au XIXe siècle*. Paris: Presses Universitaires, 1950.

Chevalier, Michel et al. *Religion Saint-Simonienne: Politique industrielle et Système de la Méditerranée*. Paris: Everat, 1832.

Choay, Françoise. *The Modern City: Planning in the Nineteenth Century*. New York: G. Braziller, 1970.

Choisy, Auguste. *Histoire de l’architecture*. Paris: Gauthier-Villars, 1899.

Christ, Yvan. “Merimée, Viollet-le-Duc et les premiers daguerréotypes de Notre-Dame.” *Terre d’Images* 5 (September-December 1964): 644-647.

Cinar, Alev and Thomas Bender, eds. *Urban Imaginaries: Locating the Modern City*. Minneapolis: University of Minnesota Press, 2007.

Clark, T.J. *The Painting of Modern Life: Paris in the Art of Manet and his Followers.* Princeton: Princeton University Press, 1985.

Clarke, Desmond. *Descartes’ Theory of Mind*. Oxford: Oxford University Press, 2005.

Cointet, Nicolas de, ed. *L’Eau et Paris*. Paris: Editions Albin Michel, 2009.

Collins, Peter. *Changing Ideals in Modern Architecture: 1750-1950*. Montreal: McGill-Queens University Press, 1965.

_____. *Concrete: The Vision of a New Architecture*. Second Edition. Montreal: McGill-Queens University Press, 2004.

Cohen, Jean-Louis. “Introduction.” In Le Corbusier, *Toward an Architecture*. Translated by John Goodman, 1-78. Los Angeles: Getty Research Institute, 2007.

Colomina, Beatriz, ed. *Architecturereproduction*. Princeton: Princeton Architectural Press, 1988.

_____. *Privacy and Publicity: Modern Architecture as Mass Media*. Cambridge: MIT Press, 1996.

Corbin, Alain. "Paris-Province." In *Realms of Memory: Conflicts and Divisions*. Vol. 1, edited by Pierre Nora. Translated by Arthur Goldhammer, 427-465. New York: Columbia University Press, 1996.

Crary, Jonathan. *Suspensions of Perception: Attention, Spectacle, and Modern Culture*. Cambridge: MIT Press, 1999.

_____. *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century*. Cambridge: MIT Press, 1990.

Clavel, Sylvie and Isabelle Chalet-Bailhache, eds. *Paris et ses expositions universelles. Architectures, 1855-1937*. Paris: Centre des monuments nationaux, 2008.

Dagognet, François. *Étienne-Jules Marey: A Passion for the Trace*. Translated by Robert Galeta with Jeanine Herman. New York: Zone, 1993.

Dahlberg, Laurie. "Victor Regnault, Louis Robert, and Photography at the Manufacture Impériale de Porcelaine de Sèvres, 1845-1865." PhD diss., Princeton University, 1999.

Daniel, Malcolm, ed. *The Photographs of Édouard Baldus*. New York: Abrams, 1994.

Dartein, Fernand de. *Discours prononcé par M. l'inspecteur-général de Dartein, aux obsèques de Léon Perronne, chef des travaux photographiques à l'École des ponts et chaussées, le 20 septembre 1895, à Chailly*. Paris: Impr. de Reullier, 1895.

_____. *Étude sur l'architecture lombarde et sur les origins de l'architecture romano-byzantine*. Paris: Dunod, 1865-1882.

_____. *Études sur les ponts en pierre remarquables par leur décoration, antérieurs au XIXe siècle*. Paris: Béranger, 1907-1912.

_____. *Le Pont-Neuf sur la Seine, à Paris, 1578-1607. Notice descriptive et historique*. Paris: Imprimerie Polytechnique Béranger, 1911.

_____. *M. Léonce Reynaud, sa vie et ses œuvres*. Paris: Imprimerie A. Lahure, 1885.

_____. *La Vie et les travaux de Jean-Rondolphe Perronet*. Paris: Imprimerie E. Bernard, 1907.

Daston, Lorraine and Peter Galison. *Objectivity*. New York: Zone Books, 2007.

Davanne, Louis-Alphonse. *Conférences sur la Photographie*. Paris: ENPC, 1883.

_____. *Exposition universelle de Vienne en 1873. Section française. Rapport sur la photographie*. Vol. 3. Paris: Imprimerie Nationale, 1875.

_____. *La Photographie*. *Traité théorique et pratique*. Paris: Gauthier-Villars, 1886.

Davidson, Graeme. "Festivals of Nationhood: The International Exhibitions." In *Australian Cultural History*, eds. Samuel Louis Goldberg and Francis Barrymore Smith, 158-174. Melbourne: Cambridge University Press, 1988.

Debray, Paul. *Exposition universelle international de 1900 à Paris. Rapports du jury international.* Paris: Imprimerie Nationale, 1902.

Deputte, Jocelyne van. *Ponts de Paris*. Paris: Editions Sauret, 1994.

Didi-Huberman, Georges. *Invention of Hysteria: Charcot and the Photographic Iconography of the Salpêtrière*. Translated by Alisa Hartz. Cambridge: MIT Press, 2003.

Ducuing, François. *L' Exposition universelle de 1867 illustrée*. Paris: Administration, 1867.

Dumas, Philippe. *Paris la rue, un autre 1900. Les fonds de l'Union photographique française aux Archives de Paris*. Paris: Direction des affaires culturelles, 2000.

Duplomb, Charles. *Histoire générale des ponts de Paris*. Paris: Imprimerie de J. Mersch, 1911.

École des Ponts et Chaussées. *Collection de 350 dessins, relatifs à l'art de l'ingénieur et lithographiés à l'École royale des ponts et chausses*. Paris: ENPC, 1817.

Eigen, Edward. "Dark Space and the Early Days of Photography as a Medium." *Grey Room* 3 (Spring 2001): 91-111.

_____. "Subject to Circumstance: The Landscape of the French Lighthouse System." In *Landscapes of Memory and Experience*, ed. Jan Birksted, 87-104. London: Spon Press, 2000.

Ellenbogen, Josh. "Camera and Mind." *Representations* 101 (Winter 2008): 86-115.

El-Khoury, Rodolphe. "Polish and Deodorize: Paving the City in Late-Eighteenth-Century France." *Assemblage* 31 (1996): 6-15.

English, Donald. *Political Uses of Photography in the Third French Republic, 1871-1914*. Ann Arbor: UMI Research Press, 1981.

Etlin, Richard. "Le Corbusier, Choisy, and French Hellenism: The Search for a New Architecture." *The Art Bulletin* 69, no. 2 (June 1987): 264-278.

_____. *Symbolic Space: French Enlightenment Architecture and its Legacy*. Chicago: University of Chicago Press, 1994.

Evans, Robin. *The Projective Cast: Architecture and its Three Geometries*. Cambridge: MIT Press, 2000.

_____. *Translations from Drawing to Building and Other Essays*. London: Architectural Association, 1997.

Excoffon, Gisèle and Jean Michel. "L'École des ponts et chausses et la photographie." *Photogénies* 2 (September 1983): 6-16.

Exposition universelle à Paris en 1878. Notices sur les modèles, cartes, et dessins relatifs aux travaux des ponts et chaussées. Paris: Imprimerie Nationale, 1878.

Exposition universelle à Paris en 1889. Notices sur les modèles, dessins et documents divers relatifs aux travaux des ponts et chaussées et des mines. Paris: Imprimerie Nationale, 1889.

L'Exposition universelle de 1867. Guide de l'exposant et du visiteur avec les documents officiels, un plan et une vue de l'Exposition. Paris: Hachette, 1866.

Fanelli, Giovanni. *Storia della fotografia di architettura*. Rome: Laterza, 2009.

Ferguson, Pricilla. *Paris as Revolution: Writing the Nineteenth-Century City*. Berkeley: University of California Press, 1994.

Foucault, Michel. *Discipline and Punish: The Birth of the Prison*. Translated by Alan Sheridan. New York: Vintage Books, 1979.

Foureaut, Annie, ed. *La Ville divisée. Les ségrégations urbaines en question. France XVIII^{e}-XX^{e} siècles*. Paris: Créaphis, 1997.

Fournel, Victor. *Paris nouveau et Paris future*. Paris: Jacques Lecoffre, 1865.

Freund, Gisèle. *Photographie et société*. Paris: Éditions du Seuil, 1974.

Frey, Jean-Pierre. "Généalogie du mot 'urbanisme'" *Urbanisme* 304 (January-February 1999): 53-71.

Gandy, Matthew. *Concrete and Clay: Reworking Nature in New York*. Cambridge: MIT Press, 2003

_____. "The Paris Sewers and the Rationalization of Urban Space." *Transactions of the Institute of British Geographers* 24, no. 1 (1999): 23-44.

Garelick, Rhoda. *Electric Salomé: Loïe Fuller's Performance of Modernism*. Princeton: Princeton University Press, 2007.

Gay, Jean. *L'Amélioration de l'existence à Paris sous le règne de Napoléon III. L'Administration de service à l'usage public*. Geneva: Droz, 1986.

Geiger, Reed. *Planning the French Canals: Bureaucracy, Politics, and Enterprise under the Restoration*. Newark: University of Delaware Press, 1994.

Gervais, Thierry. "Photographies de presse? Le journal *L'Illustration* à 'ère de la simigravure." *Études photographiques* 16 (May 2010): 166-181.

Giberti, Bruno. *Designing the Centennial: A History of the 1876 International Exhibition in Philadelphia*. Lexington: University Press of Kentucky, 2002.

Giddens, Anthony. "Modernism and Postmodernism." *New German Critique* 22 (Winter 1981): 15-18.

Giedion, Sigfried. *Building in France, Building in Iron, Building in Ferroconcrete*. Translated by J. Duncan Berry. Los Angeles: Getty Center for the History of Art and the Humanities, 1995.

_____. *Space, Time, and Architecture: The Growth of a New Tradition*. 5th Edition. Cambridge: Harvard University Press, 2008.

Girard, Louis. *La Politique des travaux publics du Second Empire*. Évreux: Imprimerie Hérissey, 1952.

Gonjo, Yasou. "Le 'plan Freycinet,' 1878-1882: un aspect de la 'grande dépression' économique en France." *Revue Historique* 23, no. 1 (July-September 1872): 49-86.

Gorz, André. *Ecologica*. Translated by Chris Turner. London: Seagull Books, 2010.

Goubert, Jean-Pierre. *The Conquest of Water: The Advent of Health in the Industrial Age*. Cambridge: Polity Press, 1989.

Grabar, Oleg. *The Great Mosque of Isfahan*. New York: Tauris, 1990.

Green, Nicholas. *The Spectacle of Nature: Landscape and Bourgeois Culture in Nineteenth-Century France.* Manchester: Manchester University Press, 1990.

Greenhalgh, Paul. *Ephemeral Vistas: Expositions Universelles, Great Exhibitions, and World's Fairs, 1851-1939.* Manchester: Manchester University Press, 1988.

Griffiths, David Albert. *Jean Reynaud, encyclopédiste de l'époque romantique, d'après sa correspondence inédite*. Paris: M. Rivière, 1965.

Guigueno, Vincent. *Au service des phares. La Signalisation maritime en France, XIXe-XXe siècle*. Rennes: Presses universitaires de Rennes, 2001.

Gunning, Tom. "An Aesthetic of Astonishment: Early Film and the (In)Credulous Spectator." In *Viewing Positions: Ways of Seeing Film*, edited by Linda Williams, 114-133. Rutgers: Rutgers University Press, 1994.

Gunthert, André. "Naissance de la Société française de photographie." In *L'Utopie photographique*, ed. Michel Poivert, 14-24. Paris: Le Point du jour, 2004.

_____. "La Rétine du savant. La Fonction heuristique de la photographie." *Études photographiques* 7 (May 2000): 29-45.

Habermas, Jürgen. *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society*. Translated by Thomas Burger. Cambridge: MIT Press, 1991.

Hambourg, Maria Morris, Françoise Heilbrun, and Philippe Néagu, eds. *Nadar*. New York: Harry N. Abrams, 1995.

Hamon, François. *Louis Visconti, 1791-1853*. Paris: DAAVP, 1992.

Hannavy, John, ed. *Encyclopedia of Nineteenth-Century Photography*. New York: Routledge, 2008.

Harvey, David. *Paris, Capital of Modernity*. New York: Routledge, 2003.

Haussmann, Baron Georges-Eugène von. *Histoire générale de Paris. Collection de documents fondée avec l'approbation de l'empereur*. Paris: Imprimerie Impériale, 1866.

_____. *Mémoires du Baron Haussmann*. 5 vols. Paris: Victor-Harvard, 1890.

Hayek, Friedrich August. *The Counter Revolution of Science: Studies on the Abuse of Reason*. Indianapolis: Liberty Press, 1979.

Hazan, Eric. *L'Invention de Paris. Il n'y a pas de pas perdu*. Paris: Seuil, 2002.

Hershman, Joel and William Clark. *Un voyage héliographique à faire: The Mission of 1851: The First Photographic Survey of Historical Monuments in France*. Flushing: Queens College, 1981.

Hitchcock, Henry-Russell. *Architecture: Nineteenth and Twentieth Centuries*. Fourth Edition. London: Penguin, 1977.

_____. *Modern Architecture: Romanticism and Reintegration*. New York: Payson and Clarke, 1929.

Hugo, Victor. *Notre-Dame de Paris* [1831]. Paris: Eugène Renduel, 1836.

Hutchinson, Elizabeth. "They Might be Giants: Carleton Watkins, Galen Clark, and the Big Tree," *October* 109 (Summer 2004): 46-63.

Jackson, Jeffrey. *Paris Under Water: How the City of Light Survived the Great Flood of 1910*. New York: Palgrave Macmillan, 2010.

Jameson, Fredric. *Postmodernism, or, the Cultural Logic of Late Capitalism*. Durham: Duke University Press, 1991.

Janis, Eugenia Parry. "Demolition Picturesque: Photographs of Paris in 1852 and 1853 by Henri Le Secq." In *Perspectives on Photography, Essays in Honor of Beaumont Newhall*, ed. Peter Walch and Thomas Barrow, 33-66. Albuquerque: University of New Mexico Press, 1986.

_____. "The Man on the Tower of Notre Dame: New Light on Henri LeSecq." *Image* 19 (December 1976): 13-23.

Jordan, David. "Haussmann and Haussmannisation: The Legacy for Paris." *French Historical Studies* 27, no. 1 (Winter 2004): 87-113.

_____. *Transforming Paris: The Life and Labors of Baron Haussmann*. New York: The Free Press, 1995.

Judovitz, Dalia. "Vision, Representation, and Technology in Descartes." In *Modernity and the Hegemony of Vision*, ed. Davin Levin, 63-86. Berkeley: University of California Press, 1993.

Kafka, Ben. *The Demon of Writing: The Powers and Failures of Paperwork*. Cambridge: MIT Press, 2012.

Kaplan, Robert. *Forgotten Crisis: The Fin-de-Siècle Crisis of Democracy in France.* Oxford: Berg Publishers, 1995.

Keller, Ulrich. "Durandelle, the Paris Opera, and the Aesthetics of Creativity." *Gazette des Beaux-Arts* 111 (January-February 1988): 109-18.

Kelsey, Robin. *Archive Style: Photographs and Illustrations for the U.S. Survey, 1850-1890*. Berkeley: University of California Press, 2007.

_____. "Viewing the Archive: Timothy O'Sullivan's Photographs for the Wheeler Survey, 1870-74," *The Art Bulletin* 85, No. 4 (December 2003): 702-723.

Kleitz, Charles. *Exposition universelle de Vienne en 1873. Section française. Rapport sur les travaux du genie civil*. Paris: Imprimerie Nationale, 1875.

Kracauer, Siegfried. *The Mass Ornament: Weimar Essays*. Translated by Thomas Levin. Cambridge: Harvard University Press, 1995.

Kranakis, Eda. *Constructing a Bridge: An Exploration of Engineering Culture, Design, and Research in Nineteenth-Century France and America*. Cambridge: MIT Press, 1997.

Krauss, Rosalind. "Photography's Discursive Spaces: Landscape/View." *Art Journal* 43, No. 2 (Winter 1982): 311-319.

_____. "Tracing Nadar." *October* 5 (Summer 1978): 29-47.

Lalanne, Léon. *Essai philosophique sur la technologie.* Paris: Bourgogne et Martinet, 1840.

_____. *Notice sur la vie et les travaux de E. Belgrand*. Paris: Dupont, 1881.

Lambert, Guy. *Les Ponts de Paris*. Paris: Action artistique de la Ville de Paris, 2000.

Latour, Bruno. *Paris ville invisible*. Paris: Empecheurs Penser en Rond, 1998.

_____. "Visualization and Cognition: Thinking with Eyes and Hands." *Knowledge and Society* 6 (1986): 24-26.

Laussedat, Aimé. *Recherches sur les instruments, les méthodes et le dessin topographique*. 2 vols. Paris: Gauthier-Villars, 1898-1903.

Launay, Françoise. "Jules Janssen et la photographie." In *Dans le champ des étoiles. Les Photographies et le ciel, 1850-2000*, ed. Quentin Bajac, 78-83. Paris: Réunion des Musées Nationaux, 2000.

Lavin, Sylvia. "Re-Reading the Encyclopedia: Architectural Theory and the Formation of the Public in Late-Eighteenth-Century France." *The Journal of the Society of Architectural Historians* 53, no. 2 (June 1994): 184-192.

Le Bon, Gustave. *Les levers photographiques et la photographie en voyage*. Paris: Gauthier-Villars, 1889.

Lechalas, Georges. *Manuel de droit administratif. Services des ponts et chaussées et des chemins vicinaux*. Paris: Baudry, 1889.

Lee, Min Kyung. "An Objective Point of View: The Orthogonal Gird in Eighteenth-Century Plans of Paris." *The Journal of Architecture* 17, no. 1 (February 2012): 11-34.

Lee, Sanghun. "Technology and Form: Iron Construction and Transformation of Architectural Ideas in Nineteenth-Century France, 1830-1889." PhD diss., Massachusetts Institute of Technology, 1996.

Lefebvre, Henri. *The Sociology of Marx* [1966]. Translated by Norbert Guterman. New York: Columbia University Press, 1982.

_____. *The Urban Revolution* [1970]. Translated by Robert Bononno. Minneapolis: The University of Minnesota Press, 2003.

Lefèvre, Wolfgang, ed. *Picturing Machines, 1400-1700*. Cambridge: MIT Press, 2004.

Lehning, James. *To Be a Citizen: The Political Culture of the Early French Third Republic*. Ithaca: Cornell University Press, 2001.

Lemoine, Bertand. *Construire, equipper, aménager. La France des ponts et chaussées*. Paris: Gallimard, 2005.

_____. *Un musée retrouvé. Le Musée des travaux publics, 1939-1955*. Paris: École des Ponts et Chaussées, 1991.

_____ and Mark Mimram, eds. *Paris d'ingénieurs*. Paris: Picard, 1995.

Levin, Miriam. *Republican Art and Ideology in Late Nineteenth-Century France*. Ann Arbor: UMI Research Press, 1986.

Lynch, Michael. "Science in the Age of Mechanical Reproduction: Moral and Epistemic Relations between Diagrams and Photographs." *Biology and Philosophy*, 6 (1991): 205-226.

Levine, Neil. "Castle Howard and the Emergence of the Modern Architectural Subject." *Journal of the Society of Architectural Historians* 62, no. 3 (September 2004): 326-351.

_____. *Modern Architecture: Representation and Reality*. New Haven: Yale University Press, 2010.

_____. "The Template of Architectural Photography in Nineteenth-Century Architectural Representation." *Journal of the Society of Architectural Historians* 71, no. 3 (September 2012): 306-331.

Lock, Frédéric. "Les ponts, les ports et les rues." In *Paris Guide*, Vol. 2, 1412-1445. Paris: Libraire internationale, 1867.

Lortie, André, ed. *Paris s'exporte. Modèle d'architecture ou modèles d'architecture*. Paris: Picard, 1995.

Loyer, Fraçois. *Paris Nineteenth Century: Architecture and Urbanism*. Translated by Charles Lynn Clark. New York: Abbeville Press Publishers, 1988.

Lubar, Steven. "Representation and Power." *Technology and Culture* 36, no. 3 (April 1995): 54-82.

Luxenberg, Alisa. "Creating *Désastres*: Andrieu's Photographs of Urban Ruins in the Paris of 1871." *The Art Bulletin* 80, no.1 (March 1998): 113-137.

Mandoul, Thierry. *Entre raison et utopie. L'Histoire de L'Architecture d'Auguste Choisy*. Wavre: Mardaga, 2008.

_____. "From Rationality to Utopia: Auguste Choisy and Axonometric Projection." In *Perspective, Projections, and Design: Technologies of Architectural Representation*, eds., Mario Carpo and Frédérique Lemerle, 151-162. London: Routledge, 2007.

Marin, Louis. *De la représentation*. Paris: Gallimard Le Seuil, 1994.

Marsden, Ben and Crosbie Smith. *Engineering Empires: A Cultural History of Technology in Nineteenth-Century Britain*. Hampshire: Palgrave Macmillan, 2005.

Marx, Leo. *The Machine in the Garden: Technology and the Pastoral Ideal in America*. Fifth Edition. New York: Oxford University Press, 2000.

Mayeur, Jean-Marie. *Les Débuts de la IIIe Republique, 1871-1898*. Paris: Ed. Du Seuil, 1973.

Mathieu, Auguste. *L'Expropriation pour cause d'utilité publique et les eaux de la Somme-Soude, de la Dhuis, du Sourdon et du Surmelin*. Épernay: Noel-Bucart, 1862.

Caroline Mathieu, ed. *1889. La Tour Eiffel et L'Exposition universelle*. Paris: Editions de la Réunion des Musées Nationaux, 1989.

McCauley, Elizabeth Anne. *Industrial Madness: Commercial Photography in Paris, 1848-1871*. New Haven: Yale University Press, 1994.

_____. "François Arago and the Politics of the French Invention of Photography." In *Multiple Views: Logan Grant Essays on Photography, 1983-1989*, edited by Daniel P. Younger, 43-69. Albuquerque: University of New Mexico Press, 1991.

Mead, Christopher. *Charles Garnier's Paris Opera: Architectural Empathy and the Renaissance of French Classicism*. Cambridge: MIT Press, 1991.

_____. "Urban Contingency and the Problem of Representation in Second Empire Paris." *Journal of the Society of Architectural Historians* 54 (June 1995): 138-174.

Le Mée, Isabelle-Cécile. "Collard, photographe des Ponts et Chaussées." *Histoire de l'art* 13/14 (May 1989): 31-45.

Le Mée, René. "Le cholera et la question des logements insalubres à Paris (1832-1849)." *Population* 53, no. 1-2 (January-April 1998): 379-397.

Mercier, Louis-Sébastien. *Tableaux de Paris*. Vol. 1. Amsterdam: Virchaux & Compagnie, 1782-1788.

Mertens, Joost. "Technology as the Science of the Industrial Arts: Louis-Sebastien Lenormand (1757-1837) and the Popularization of Technology." *History and Technology* 18, no. 3 (2002): 203-231.

Middelton, Robin, ed. *The Beaux Arts and Nineteenth-Century French Architecture*. London: Thames and Hudson, 1982.

_____. "The Rationalist Interpretations of Classicism of Léonce Reynaud and Viollet-le-Duc." *AA Files* 11 (Spring 1986): 29-48.

Mondenard, Anne de. *La Mission Héliographique: Cinq photographes parcourent la France en 1851*. Paris: Centre des Monuments Nationaux, 2002.

Morizet, André. *Du vieux Paris au Paris modern*. Paris: Hachette, 1932.

Morrison, Ian. "'The Accompaniments of European Civilization': Melbourne Exhibitions, 1854-1888." *La Trobe Journal* 56 (Spring 1995): 6-11.

Murphy, Kevin D. "The Historic Building in the Modernized City: The Cathedrals of Paris and Rouen in the Nineteenth Century." *Journal of Urban History* 37, no. 2 (2011): 278-269.

Musso, Pierre. *Télécommunications et philosophie des réseaux. La Postérité paradoxale de Saint-Simon*. Paris: Presses universitaires de France, 1997.

Nadar, Felix. "Le Dessus et le dessous de Paris." In *Paris Guide*. Vol. 2, 1569-1592. Paris: Libraire internationale, 1867.

_____. *Quand j'étais photographe*. Paris: Ayer, 1889.

Nagat, Nobuhito. *Les conseillers municipaux de Paris sous la Troisième République, 1871-1914*. Paris: Publications de la Sorbonne, 2002.

Nesbit, Molly. *Atget's Seven Albums*. New Haven: Yale University Press, 1992.

Néagu, Philippe et al. *La Mission héliographique: photographies de 1851*. Paris: Sitecmo, 1980.

Neumann, Dietrich. *Architecture of the Night: The Illuminated Building*. New York: Prestel Verlag, 2002.

Nye, David E. *American Technological Sublime*. Cambridge: MIT Press, 1994.

O'Connell, Lauren. "Afterlives of the Tour Saint-Jacques: Plotting the Perceptual History of an Urban Fragment." *Journal of the Society of Architectural Historians* 60, no. 4 (December 2001): 450-473.

_____. "Viollet-le-Duc on Drawing, Photography, and the 'Space Outside the Frame.'" *History of Photography* 22, no. 2 (Summer 1998): 139-146.

Oliver, Stuart. "The Desire to Metabolize Nature: Edward Loveden Loveden, William Vanderstegen, and the Disciplining of the River Thames." In *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*, edited by Nik Heynen, Maria Kalka, and Erik Swyngedouw, 93-109. London: Routledge, 2006.

Paul, Harry. *From Knowledge to Power: The Rise of the Science Empire in France, 1860-1939*. Cambridge: Cambridge University Press, 1985.

Pérez-Gómez, Alberto. *Architecture and the Crisis of Modern Science*. Cambridge: MIT Press, 1983.

_____. "Architecture as Drawing." *Journal of Architectural Education* 2 (Winter 1982): 2-7.

_____ and Louise Pelletier. *Architectural Representation and the Perspective Hinge.* Cambridge: MIT Press, 1997.

Papayanis, Nicholas. *Planning Paris before Haussmann*. Baltimore: The Johns Hopkins University Press, 2004.

Parego, Elvire. "Delmaet et Durandelle ou 'La rectitude des lignes.'" *Photographies* 5 (July 1984): 55-75.

Parville, Henri de. *Causeries scientifiques*. Paris: Rothschid, 1890.

Pelizzari, Maria Antonella, ed. *Traces of India: Photography, Architecture, and the Politics of Representation, 1850-1900*. New Haven: Yale University Press, 2003.

Piazza, Pierre, ed. *Aux origins de la police Scientifique. Alphonse Bertillon, précurseur de la science du crime*. Paris: Kathala Éditions, 2011.

Picon, Antoine. "De l'utilité des travaux publics aux XVIIIe et XIXe siècles." In *Acteurs privés et acteurs publics. Une Histoire du partage des roles*, edited by Jaques Theys, Monique Cavagnara, and Nathalie Montel, 129-136. Paris: Ministère de l'Equipement, 1994.

_____. “Engineers and Engineering History: Problems and Perspectives.” *History and Technology* 20, no. 4 (December 2004): 421-436.

_____. “From ‘Poetry of Art’ to Method: The Theory of Jean-Nicolas-Louis Durand.” In *Précis of the Lectures on Architecture: With Graphic Portion of the Lectures on Architecture*, translated by David Britt, 1-70. Los Angeles: Getty Publications, 2000.

_____. "Gestes ouvriers, opérations et processus techniques. La vision du travail des encyclopédistes." *Recherches sur Diderotet sur l’Éncyclopédie* 13 (1992): 131-47.

_____. *L'Invention de l'ingénieur moderne. L'École des Ponts et Chaussées, 1747-1851*. Paris: Presses de l'École nationale des ponts et chaussées, 1992.

_____. "Navier and the Introduction of Suspension Bridges in France." *Construction History* 4 (1988): 21-34.

_____, Bruno Belhoste, and Francine Masson, eds. *Le Paris des Polytechniciens. Des ingénieurs dans la ville (1794-1994)*. Paris: Délégation à l’Action Artistique de la Ville de Paris, 1994.

_____. *Les Saint-simoniens. Raison, imaginaire et utopia*. Paris: Belin, 2002.

Pinkney, David. *Napoleon III and the Rebuilding of Paris*. Princeton: Princeton University Press, 1958.

Pollock, Griselda. *Vision and Difference: Femininity, Feminism, and the Histories of Art*. New York: Routledge, 1988.

Pontich, Henri de. *Administration de la ville de Paris et du département de la Seine*. Paris: Guilaumin, 1884.

Porter, Theodore. *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life*. Princeton: Princeton University Press, 1995.

Potofsky, Allan. “The Construction of Paris and the Crises of the Ancien Régime: The Police and the People of the Parisian Building Sites, 1750-1789.” *French Historical Studies* 27, no. 1 (Winter 2004): 9-48.

Proudhon, Pierre-Joseph. *Du principe de l’art et de sa destination sociale*. Paris: A. Lacroix, 1865.

Reid, Donald. *Sewers and Sewermen: Realities and Representations*. Cambridge: Harvard University Press, 1993.

Reynaud, Léonce. “Architecture.” In *Encyclopédie nouvelle*, Vol. 1, edited by Pierre Leroux et Jean Reynaud, 770-777. Paris: C. Gosselin, 1835-1841.

_____. *Mémoire sur l'éclairage et le balisage des côtes de France*. Paris: Imprimerie impériale, 1864.

_____. *Traité d'architecture*. 2 vols. Paris: Dunod, 1867-70.

_____, ed. *Les Travaux publics de la France*. 5 vols. Paris: Rothschild, 1882.

Rice, Shelly. *Parisian Views*. Cambridge: MIT Press, 1997.

Robert, Louis-Rémy. *Notes sur les manipulations photographiques*. Paris: ENPC, 1868.

Robinet, Stéphane. *Eaux de Paris. Lettre à un conseiller d'état. Pour server de réponse aux adversaires des projets de la ville de Paris*. Paris: Bouchard-Huzard, 1862.

Rosenberg, Elissa. "Public Works and Public Space: Rethinking the Urban Park." *Journal of Architectural Education* 50, no. 2 (November 1996): 89-103.

Roubert, Paul-Louia. "Les fonds de la distinction. Le financement des sociétés photographiques du XIXe siècle." *Études photographiques* 24 (November 2009): 18-41.

Rouillé, André. "Les images photographiques du monde du travail sous le Second Empire." *Actes de la recherche en science sociales* 54 (September 1984): 31-43.

Rudwick, Martin. *Bursting the Limits of Time: The Reconstruction of Geohistory in the Age of Revolution*. Chicago: University of Chicago Press, 2005.

Saint, Andrew. *Architect and Engineer: A Study in Sibling Rivalry*. New Haven: Yale University Press, 2008.

Sakarovitch, Joel. *Epures d'architecture: De la coupe des pierres à la géométrie descriptive, XVI - XIX siècles*. Basel: Birkhäuser, 1998.

Schiffer, Michael. "The Electric Lighthouse in the Nineteenth Century: Aid to Navigation and Political Technology." *Technology and Culture* 48, no. 2 (April 2005): 275-305.

Schnapp, Jeffrey. "Three Pieces of Asphalt." *Grey Room* 11 (Spring 2003): 5-21.

Schwartz, Vanessa. *Spectacular Realities: Early Mass Culture in Fin-de-Siècle Paris*. Berkeley: University of California Press, 1998.

Sekula, Alan. "The Body and the Archive." *October* 39 (Winter 1986): 3-64.

Shinn, Terry. *Savoir scientifique et pouvoir social. L'Ecole polytéchnique, 1794-1914*. Paris: Presses de la Fondation Nationale des Sciences Politiques, 1980.

Sicard, Monique. “Passage de Vénus.” *Études photographiques* 4 (May 1998): 44-60.

Silverman, Debora. *Art Nouveau in Fin-de-Siècle France: Politics, Psychology, and Style*. Berkeley: University of California Press, 1989.

_____. “The Paris Exhibition of 1889: Architecture and the Crisis of Individualism.” *Oppositions* 8 (Spring 1977): 71-91.

Smith, Neil. *Uneven Development: Nature, Capital, and the Production of Space*. Athens: University of Georgia Press, 2008.

Snyder, Joel. “Picturing Vision.” *Critical Inquiry* 5, no. 3 (Spring 1980): 499-526.

D’Souza, Aruna and Tom McDonough, eds. *The Invisible Flâneuse? Gender, Public Space, and Visual Culture in Nineteenth Century Paris*. Manchester: Manchester University Press, 2006.

Stamper, John. “The Galerie des Machines of the 1889 Paris World’s Fair.” *Technology and Culture* 30, no. 2 (April 1989): 332-353.

_____. “The Industry Palace of the 1872 World’s Fair: Karl von Hasenauer, John Scott Russell, and New Technology in Nineteenth-Century Vienna.” *Architectural History* 47 (2004): 227-250.

Strohmayer, Ulf. “Bridges: Different Conditions of Mobile Possibilities.” In *Geographies of Mobilities: Practices, Spaces, Subjects*, edited by Tim Cresswell and Peter Merriman, 119-136. Burlington: Ashgate, 2011.

_____. “Engineering Visions in Early Modern Paris.” In *The City and the Senses: Urban Culture since 1500*, edited by Alexander Cowan and Jill Steward, 75-92. Hampshire: Ashgate, 2007.

Stourdzé, Sam, ed. *Louis Robert. L'Alchimie des images*. Paris: NBC, 1999.

Summerson, John. “What is the History of Construction?” *Journal of the Construction History Society* 1 (1985): 1-2.

Tagg, John. *The Burden of Representation: Essays on Photographies and Histories*. Minneapolis: University of Minnesota Press, 1988.

Taylor, Katherine Fisher. “The Festival of Justice: Paris, 1849.” In *Law and the Image: The Authority of Art and the Aesthetics of Law*, edited by Costas Douzinas and Lynda Nead, 137-177. Chicago: University of Chicago Press, 1999.

_____. *In the Theater of Criminal Justice: The Palais de Justice in Second Empire Paris*. Princeton: Princeton University Press, 1993.

Thézy, Marie de. *Charles Marville, Paris disparu*. Paris: Paris-Musées, 1994.

_____. *Charles Marville*. *Photographe de Paris de 1851 à 1879*. Paris: Bibliothèque historique de la Ville de Paris, 1980.

Thompson, Victoria. "Telling 'Spatial Stories': Urban Space and Bourgeois Identity in Early Nineteenth-Century Paris." *Journal of Modern History* 75, no. 3 (September 2003): 523-556.

Toulet, Emmanuelle. "La cinéma à l'Exposition universelle de 1900." *Revue d'histoire modern et contemporaine* 33, no. 2 (April-June 1986): 179-209.

Varnedoe, Kirk. "The Tuileries Museum and the Uses of Art History in the Early Third Republic." In *Salloni, galerei, musei e loro influenza sullo sviluppo dell'arte de secoli XIX e XX*, edited by Francis Haskell, 63-68. Bologna: C.I.H.A., 1979.

Vesely, Dalibor. *Architecture in the Age of Divided Representation: The Question of Creativity in the Shadow of Production*. Cambridge: MIT Press, 2004.

Vidler, Anthony. "The New Industrial World: The Reconstruction of Urban Utopia in Late Nineteenth-Century France." *Perspecta* 13/14 (1971): 243-256.

_____. *The Writing of the Walls: Architectural Theory in the Late Enlightenment*. Princeton: Princeton Architectural Press, 1987.

Viette, Jules. "Circulaire du ministre des travaux publics aux ingénieurs en chef des ponts et chaussées (Personnel, 4e bureau), Paris le 15 décembre 1892." In *Recueil de lois, ordonnances, décrets, réglements et circulaires concernant les différents services du Ministère des travaux publics*, Vol. 6, 313-315. Paris: Imprimerie Administrative G. Jousset, 1893.

Viollet-le-Duc, Eugène-Emmanuel. *How to Build a House*. Translated by Benjamin Bucknall. London: Sampson Low, Marston, Searle, and Rivington, 1876.

_____. *The Foundations of Architecture: Selections from the Dictionnaire raisonné*. Translated by Kenneth D. Whitehead. New York: George Brazillier, 1990.

Voltaire, François-Marie Arouet de. *Oeuvres completes de Voltaire*. 5 vols. Paris: Librairie de Firmin Didot Frères, 1855.

Walton, John. *Western Time and Water Wars: State, Culture, and Rebellion in California*. Berkeley: University of California Press, 1993.

Walton, Willaim. *Paris Known and Unknown*. 3 vols. Philadelphia: G. Barrie & Son, 1898.

Weber, Eugen. *Peasants into Frenchmen: The Modernization of Rural France, 1870-1914*. Stanford: Stanford University Press, 1976.

Weber, Max. *Economy and Society: An Outline of Interpretive Sociology*. 2 Vols. Translated by Guenther Roth and Claus Wittich. Berkeley: University of Berkeley Press, 1978.

Weiss, John H. *The Making of Technological Man: The Social Origins of French Engineering Education*. Cambridge: MIT Press, 1982.

Wesemael, Pieter van. *Architecture of Instruction and Delight: A Socio-Historical Analysis of World Exhibitions as Didactic Phenomenon, 1798-1851-1979.* Rotterdam: 010 Publishers, 2001.

Dora Wiebenson, *The Picturesque Garden in France*. Princeton: Princeton University Press, 1978.

Wilson, Colette. "Memory and the Politics of Forgetting: Paris, the Commune and the 1878 Exposition universelle." *Journal of European Studies* 35 (2005): 47-63.

Winner, Langdon. *The Whale and the Reactor: A Search for Limits in an Age of High Technology*. Chicago: University of Chicago Press, 1988.

Wittman, Richard. *Architecture, Print Culture, and the Public Sphere in Eighteenth-Century France*. London: Routledge, 2007.

_____. "Space, Networks, and the Saint-Simonians." *Grey Room* 40 (Summer 2010): 24-49.

Wolff, Janet. "The Invisible Flâneuse: Women and the Literature of Modernity." *Theory, Culture, and Society* 2, no. 3 (1985): 37-46.

Van Zanten, David. *Building Paris: Architectural Institutions and the Transformation of the French Capital, 1830-1870*. Cambridge: Cambridge University Press, 1994.

Zimmerman, Claire. "Photographic Modern Architecture: Inside 'The New Deep.'" *The Journal of Architecture* 9 (Autumn 2004): 331-354.

Zola, Émile. *L'Oeuvre* [1886]. Paris: Fasquelle, 1967.

ILLUSTRATIONS