

PLANET
WATER
ART
AND

ASTRONOMY, GEOGRAPHY,
AND THE ART OF
MARCEL DUCHAMP



JAMES HOUSEFIELD

PLAYING
WITH EARTH
AND SKY

INTERFACES : STUDIES IN VISUAL CULTURE

Editors Mark J. Williams and Adrian W. B. Randolph, Dartmouth College

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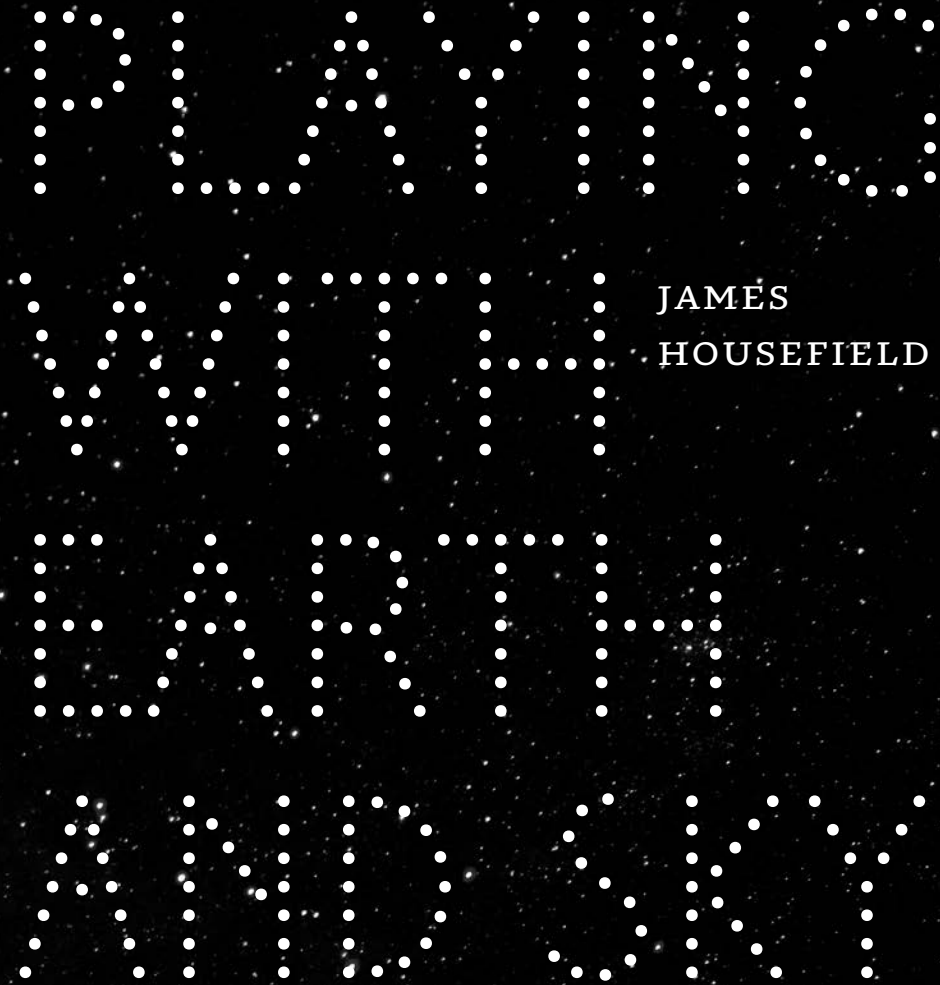
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ASTRONOMY, GEOGRAPHY, AND THE
ART OF MARCEL DUCHAMP



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Dedicated to my parents,
KEN AND BETTY HOUSEFIELD,
who inspired my love of learning about
all things on Earth and in the skies above;
to the memory of DENIS COSGROVE,
friend and mentor who showed us
the ways to join art and cosmography;
and to D², MBDH, and CADH,
my beloved fellow seekers of the
green ray, always and forever

Ad astra per aspera

Landscape is not merely the world we see,
it is a construction, a composition of that world.
Landscape is a way of seeing the world.

DENIS COSGROVE,

Social Formation and Symbolic Landscape

I believe that the laws of physics such as they are, such as they have been taught to us, are not the inevitable truth. We believe in the laws, or we experiment with them each day, yet I believe it is possible to consider the existence of a universe in which these laws would be extended, changed a very tiny bit, in a precisely demarcated way. Consequently we immediately achieve extraordinary results, different yet certainly not far from the truth. After all, every century or two a new scientist comes along who changes the laws of physics, isn't that so? After Newton there were many who did, and there were even more after Einstein, right? We have to wait to see how the laws in question will change over time, then. . . . In any case, without being a scientist myself I can still hope to reach parallel results, if you will, in art.

MARCEL DUCHAMP

We are fully human only when we play.

FRIEDRICH SCHILLER AND ARTHUR JUNG,

Schillers Briefe

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NOTE TO THE READER

Those who are not already familiar with the work and impact of Marcel Duchamp will find their reading enriched by consulting the following sources:

- Ades, Dawn, Neil Cox, and David Hopkins. *Marcel Duchamp*. World of Art Series. London: Thames & Hudson, 1999. This is a serious, yet accessible, overview of Duchamp's work that is well illustrated.
- Henderson, Linda Dalrymple. *Duchamp in Context: Science and Technology in the Large Glass and Related Works*. Princeton, NJ: Princeton University Press, 1998. Henderson's magisterial book sets the scholarly precedent for all writing on Duchamp and science. It inspired this book, which seeks to present a complementary view of Duchamp's engagement with sciences not covered in depth by Henderson.
- Naumann, Francis M. *The Recurrent, Haunting Ghost: Essays on the Art, Life, and Legacy of Marcel Duchamp*. New York: Readymade Press, 2012. Naumann's book collects a range of essays on Duchamp that provide readers with a deep dive into some of the most important aspects of Duchamp's work and legacy.
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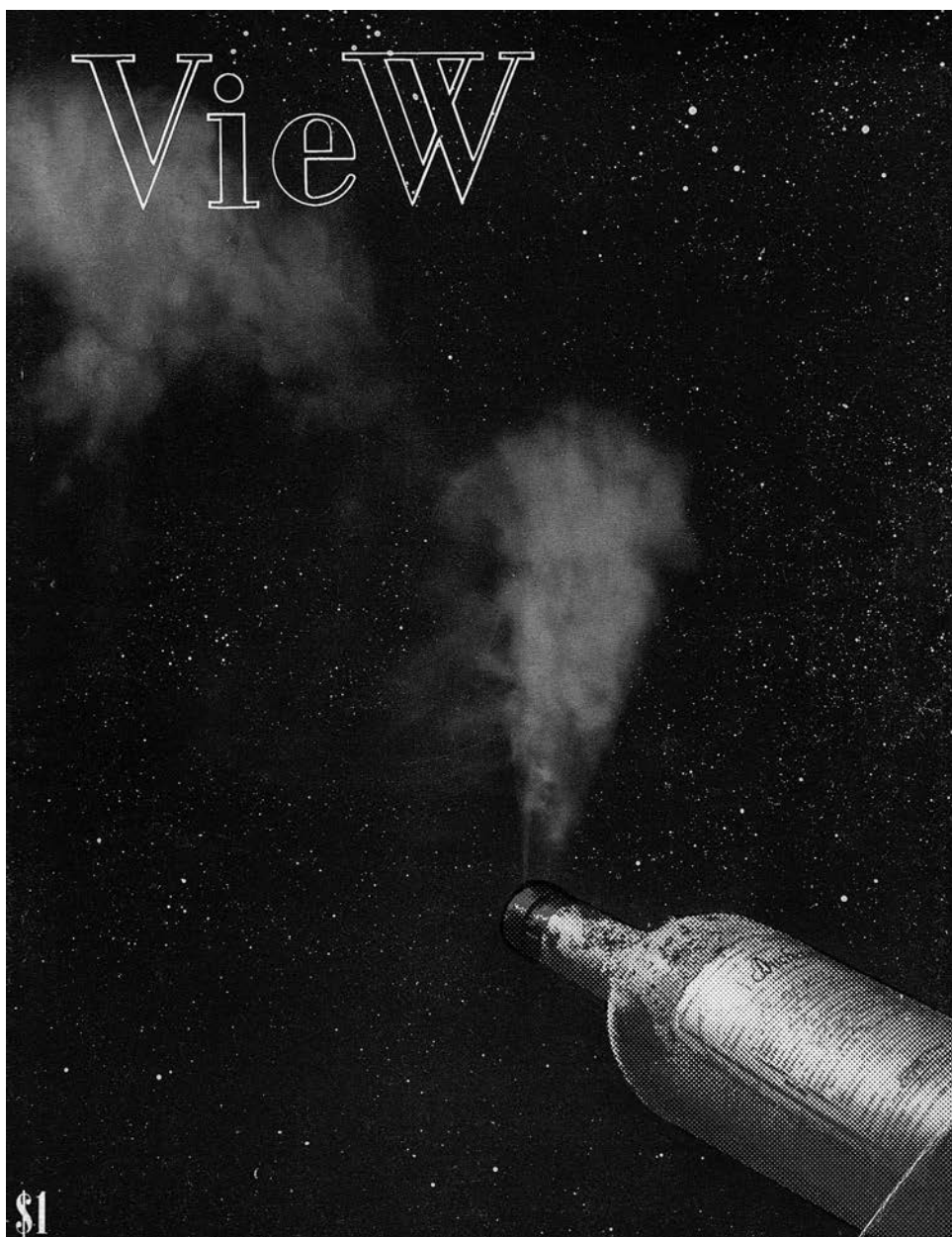
PLAYING
WITH EARTH
AND SKY

INTRODUCTION

PLAYING WITH EARTH AND SKY

- • • • • his book analyzes the proliferation of references to astronomy and geography in the work of Marcel Duchamp (1887–1968).
 - His engagement with these sciences, and with related modern developments, including aviation, was deeply playful in its attitude as a means of taking a critical stance toward the culture of his time. Duchamp especially confronted the significance of landscape, the geographically inspired subject that had dominated modern art from the 1870s on, thanks to the Impressionists. Although the story of Duchamp’s engagement with astronomy and geography could begin in many places, his design of the March 1945 issue of *View* magazine is a particularly suitable work with which to begin, because of its playful embrace of earth and sky (figure 1.1, plate 1).

Duchamp’s creation of a self-portrait for the *View* magazine’s cover boasted a curious juxtaposition well suited to the aesthetic promoted by its readers among the American avant-garde, including those Surrealists living in wartime exile. Against the velvety background of a starry sky, a dusty French wine bottle seemed to float in space on *View*’s photographic cover. Smoke emanated from the mouth of the bottle, its haze faintly materializing forms that could be variously understood. How might the first audiences have interpreted the cover image that has since become familiar enough that twenty-first-century viewers rarely pause to contemplate it? When juxtaposed against the stars, did the patterns of evanescent smoke transform into continents, resembling Africa and Europe, or perhaps North and South America? Did the smoke resemble the dense corners of the Milky Way? Was this the night sky of science at the dawn of the space age? Could it be a dream of interstellar travel such as that promised by the pulp science fiction magazines that crowded newsstands in 1945? Or did *View* offer to transport readers into a strange and distant past epoch, a time when



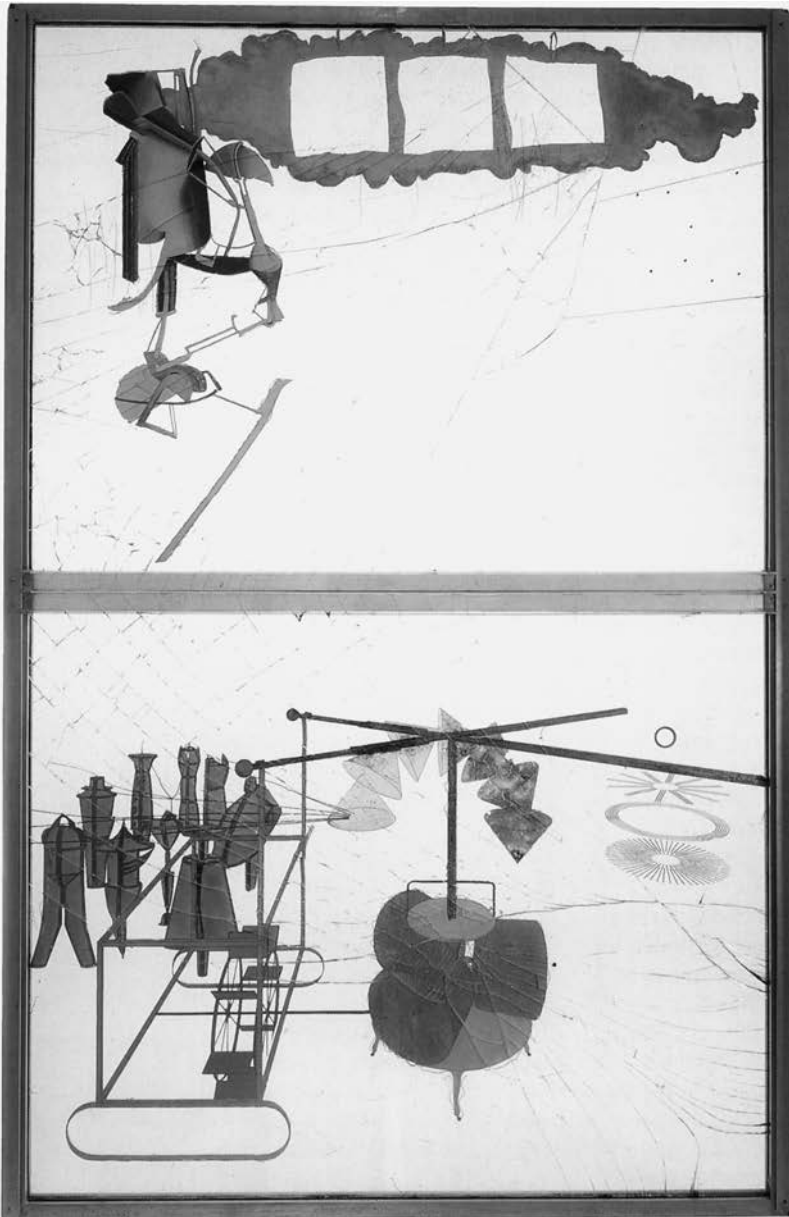
1.1. Marcel Duchamp, front cover, "Marcel Duchamp Number," special issue, *View 5*, no. 1, March 1945. Private collection. 12 x 9¹/₁₆ in. (30.5 x 23 cm). © 2015 Artists Rights Society (ARS), New York / Société des auteurs dans les arts graphiques et plastiques (ADAGP), Paris / Estate of Marcel Duchamp.

Aristotle proposed that the Milky Way had been created by the ignition of fiery “exhalation” from the stars?¹

Although the *View* cover may have left many unanswered questions for readers in 1945, one thing is clear: its staged photographic imagery presented an equivocal relationship between earth and sky. Like the duck-rabbit figure dear to perceptual psychologists and philosophers, the smoke on Duchamp’s magazine cover presented viewers with an ambiguous or bi-stable image.² Playing with perception, the image’s points of reference toggled back and forth between earth and sky as the smoke alternately assumed the shape of continents, clouds, or starry galaxies in a reader’s mind.

View magazine was a midcentury descendant of the so-called little magazines created collectively in the early 1900s as vehicles to bring modern literature, art, and design to growing audiences.³ From 1940 to 1947, *View*, like its shorter-lived counterpart *VVV* (1942–44), brought contemporary art and literature to new audiences in the United States through well-crafted publications that emphasized Surrealism as an international movement.⁴ Although every issue of *View* boasted an artist-designed cover, the cover of the March 1945 issue called for more explanation than most. Readers opening this “Marcel Duchamp Number” of *View* found details about the cover in a single-column essay running beside the table of contents, titled “I Cover the Cover.” Corporal Peter Lindamood, the essay’s author, revealed that Duchamp had designed the cover himself.⁵ The bottle’s label had been made from Duchamp’s early twentieth-century French military service record. This official document added an appropriately martial element to the design, making it suitable for a publication that appeared during the late months of World War II. Despite the liberation of France begun by the Allied Forces during the previous summer’s “D-Day” invasions of Normandy, conflicts continued to range around the globe. Duchamp’s smoking bottle occupied a fluctuating and indeterminate space between earth and sky, much like the international air space inhabited by military planes around 1945.

Most of the fifty-four pages inside this issue of *View* celebrated Duchamp through verbal and visual portraits. The cover’s smoking bottle quietly proclaimed its wartime relevance. At the same time, it offered an ingenious self-portrait that engaged moments from across the artist’s career.⁶ The smoking bottle stood in as a substitute for the pipe-smoking artist himself. An emptied wine bottle added an element to “complete” Duchamp’s first readymade sculpture, the *Bicycle Wheel* (1912). Duchamp’s notes for *The*



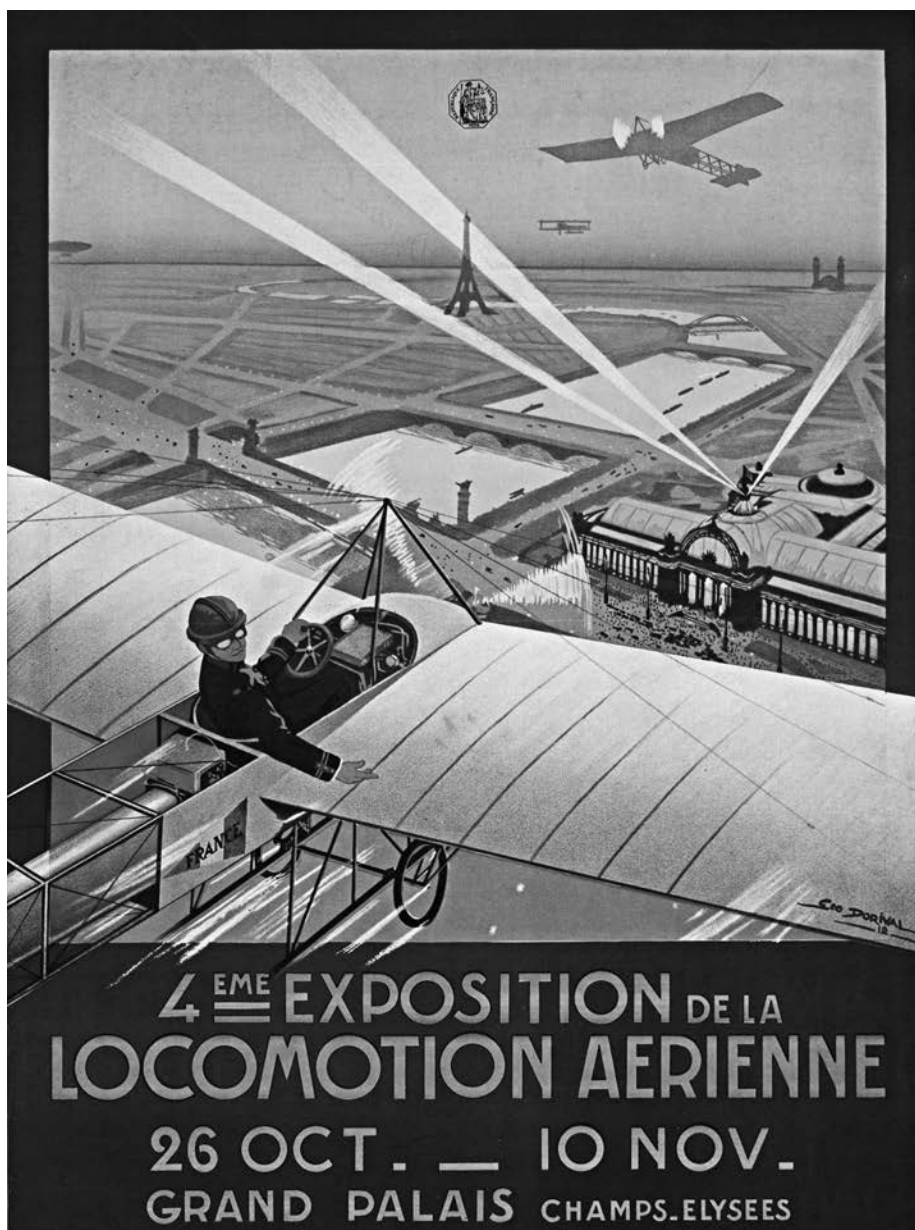
1.2. Marcel Duchamp, *The Bride Stripped Bare by Her Bachelors, Even (The Large Glass)*, 1915–23. Oil, varnish, lead foil, lead wire, and dust on two glass panels, 109¼ x 69¼ in. (277.5 x 175.9 cm). Bequest of Katherine S. Dreier, 1952. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: Philadelphia Museum of Art / Art Resource, NY.

Large Glass (1915–23) referred to a “Milky Way” in the region of the Bride, in the upper level of the *Glass*, also referenced by the *View* cover (figure 1.2). Such an array of references to the artist and his works converged on this magazine cover that pointed to the skies.

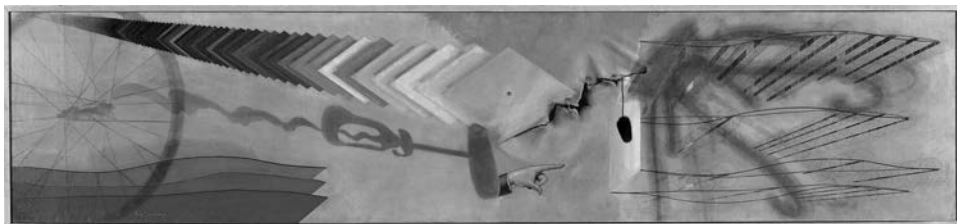
In designing the cover, Duchamp employed a conscientious design aesthetic to which he added a healthy dose of do-it-yourself bricolage to manipulate the “planetarium illusion of the background.”⁷ Inside the magazine, *View*’s publisher Charles Henri Ford evoked celestial phenomena: “Marcel,—mysterious as the internal changes of a star.”⁸ Duchamp’s *View* cover is a pointed signpost for this book, in which I propose new analyses of Duchamp’s engagement with popular sciences of astronomy and geography across his career.

Although Duchamp’s transformation of modern art is well documented, and the place of landscape within his art has attracted some scholarly attention, his engagement with terrestrial and celestial sciences has received little scrutiny. Duchamp proposed innovative approaches to art making that confronted the landscape tradition. In a group of notes written between 1914 and 1923 and eventually published in 1966 as the *White Box*, Duchamp referred to geography and related concerns of meteorology, geology, and air travel, contemplating how he might create “a geographic landscapism” and translate the landscape as if seen “from the height of an airplane” into a new form of art.⁹

Aviation, linking earth and sky, provided multiple stimuli for modern artists to represent the world in new ways. When Duchamp visited the 1912 Exposition de la locomotion aérienne in Paris, accompanied by fellow artists Constantin Brancusi and Fernand Léger, his response registered the challenges presented by the aviation industry to artists whose working methods were those of distinct craft traditions (figure 1.3, plate 2). “Painting is finished,” he declared to his companions; “who can do better than that propeller?”¹⁰ By the time Duchamp uttered this phrase, he had already passed a critical juncture in his career and begun to work outside of traditional forms of artistic creation. As a young artist he had moved rapidly through the lessons of modern painting, embracing the Impressionist and post-Impressionist representation of landscape, and then abandoning such approaches to painting in favor of Fauvist- and Cubist-inspired styles. Within a few years of his decisive declaration at the Exposition de la locomotion aérienne, Duchamp completed a work titled *Tu m’* (1918) that would be the final painting of his career (figure 1.4). Throughout the remaining



1.3. Georges Dorival, poster advertising the fourth Exposition de la locomotion aérienne, Paris, October 26–November 10, 1912. Color lithograph, 45 $\frac{7}{8}$ x 61 $\frac{1}{8}$ in. (116.6 x 155.6 cm). Collections of the Bibliothèque nationale de France, Paris. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.



1.4. Marcel Duchamp, *Tu m'*, 1918. Oil on canvas, with bottlebrush, safety pins, and bolt, 27½ x 119⅝ in. (69.8 x 303 cm). Yale University Art Gallery, Gift of the Estate of Katherine S. Dreier, 1953.6.4. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: Yale University Art Gallery.

years of his life, rumors circulated that he had abandoned making art in order to dedicate his life to playing chess. His disavowal of painting was frequently misconstrued as an abandonment of making art. For the nearly fifty years that followed the completion of *Tu m'*, until his death in 1968, Duchamp led an active creative life as a curator, designer, and artist.

Even a cursory examination of Duchamp's collected works makes it clear that his creative output increased, rather than diminished, across the decades from 1918 to 1968. In a "testimony" written in support of Duchamp for the March 1945 issue of *View*, André Breton directed attention to Duchamp's creations, ranging from exhibition design to page design, as "signs, so valuable to those who know" that "continue to bear witness to the absolutely exceptional span of his imaginative compass and mark his unshakeable fidelity to the sole principle of invention, mistress of the world."¹¹ Duchamp's creative activities after 1918 expanded dramatically, eventually encompassing many different media associated with art and design, from painting and sculpture to page design and exhibition design.¹² If painting was finished after 1912, or after 1918, for Duchamp, what took its place? Duchamp moved away from crafting unique *objects* (as in the traditions of fine arts) to create *experiences* that existed on multisensory levels and persisted on intellectual levels. Although much Duchamp scholarship argues for the significance of distinct moments of rupture, this book examines a measured trajectory of gradual change across the artist's career.¹³ Duchamp's search for new forms of representation was motivated by an abiding interest in the sciences and their popular representation—particularly the sciences of astronomy and geography. Interpreting Duchamp as a creator of experiences, rather than artworks, is a subtheme complementing



1.5. Marcel Duchamp, *Nude Descending a Staircase (No. 2)*, 1912. Oil on canvas, 57 $\frac{7}{8}$ x 35 $\frac{1}{8}$ in. (147 x 89.2 cm). The Louise and Walter Arensberg Collection, Philadelphia Museum of Art. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: Philadelphia Museum of Art / Art Resource, NY.

the major themes of this book, his engagement with astronomy and geography, as tools through which to rethink the dominance of landscape painting in modern art.

Duchamp's engagement with science and creation of a non-vicarious art of experience can be addressed neatly with a bit of deeply French wordplay. The French word *expériences* was initially associated with the laboratory and translated as "experiments." More recently it has come to be accepted as an equivalent of the Anglophone word "experiences." Duchamp brought together aspects of experience *and* of experimentation in his art. Experimental qualities connect aspects of Duchamp's works across his career, from the treatment of movement in *Nude Descending a Staircase (No. 2)* (1912; figure 1.5) to the creation of physical movement with his optical devices of the 1920s and '30s. From the creative materials that provided color in *The*

Large Glass to his assertion that an artwork's poetic title could constitute an "invisible color," Duchamp's career was characterized by experiment and experience. Moving from the painterly to the experiential, from the physical to the mental, Duchamp embraced the experimental and sought to engage art's audiences through the multiplicity of senses beyond the merely visual or "retinal."¹⁴

The art historian Linda Dalrymple Henderson has documented Duchamp's interest in the science museums of the Conservatoire national des arts et métiers, the Deutsches Museum, and the Palais de la découverte.¹⁵ Engaging playfully with scientific thought, Duchamp immersed himself in the spirit of the age without functioning as a "mirror" passively reflecting the era.¹⁶ As the poststructuralist philosopher Jacques Derrida insisted, play can be a decentering force; I interpret Duchampian play as a critical stance of resistance in the face of dominating cultural discourses, especially those of "art" and "science."¹⁷ Inspired by Alfred Jarry's notion of pataphysics, Duchamp engaged play as means and method to question and perhaps undermine modern faith in science. Though humorous, his use of play was serious and critical. In writing, I have endeavored to remain mindful of play, to make room for speculation, and to maintain a broad view of the visual and experiential cultures of Duchamp's era. I direct attention away from Duchamp at times, to focus on elements of interest in the broad cultural landscape instead.

Henderson has argued convincingly that continuing research needs to identify and understand modern art's relation to science. Following Michael Baxandall, she argues to replace art history's passive notion of influence "with a model of the artist as a pro-active seeker of information on those issues that are of interest," especially science.¹⁸ In this study, I ask how Duchamp responded to scientific developments and how those responses created possible meanings specific to the contexts (including social and artistic contexts) in which he produced them. Henderson calls for "a recovery of the science readily available to the public—whether written by scientists themselves or by science writers— . . . in order to establish the parameters of what was possible at a given moment."¹⁹ Pursuing Henderson's call for a discourse analysis of the literature of popular science, contextualized within the work of Duchamp and related artists, this book pursues such a history with a focus on astronomy and geography. Duchamp's interest in science museums is well documented. By contrast, most of the geographical and astronomical elements I assemble in this book are not presented

as direct “sources” for his work. Rather than argue for direct channels of influence, my wish is that the constellation of ideas joined together here will elucidate possible contexts of popular science. Ultimately, my goal has been to illuminate the popular sciences of astronomy and geography against which Duchamp’s work creates a kind of logic not generally perceived by contemporary audiences. Through the diverse materials studied here, from fairground attractions to mass media publications, I seek to further elucidate the fluctuating contexts through which popular audiences interpreted geography and astronomy during Duchamp’s lifetime.²⁰ Like Kirsten Hoving in her excellent book *Joseph Cornell and Astronomy*, I seek not to challenge existing interpretations of Duchamp but to offer alternative lenses through which to view his work anew.²¹ Duchamp’s work set new standards for the multivalency of art. I seek to preserve these multivalent qualities, layering meaning upon his works in ways that I hope will spark new conversations.

Recent scholarship has confirmed the deeply ingrained politics at work beneath the veneer of objective truth put forward by the terrestrial and celestial sciences in the modern era. Geography and astronomy were politically weighted pursuits that served entrenched ideologies. Duchamp’s interest in the ideas of Jarry and Max Stirner, both associated with anarchist politics, helps to clarify the ways that Duchamp’s work might be understood as political. Engaging Stirner’s radical individualism, Duchamp banished from consideration that which was external to himself.²² In a Stirnerian fashion, this clarifies that Duchamp’s first political targets were the realm of art and artists from which he separated early in his career. The modern science that his contemporaries called rational and objective Duchamp managed as if it were fictitious, irrational, and a creation of society’s imagination. Espousing a playful physics, Duchamp insisted on treating science playfully. Following this logic, one can only salvage something of interest from the false rationality of modern science by twisting or bending its supposed rules. Through his disavowal of scientific “truth,” Duchamp stepped aside from politics in the anarchic manner of Jarry and Stirner, even in the shadow of nuclear apocalypse. By the era of the space race and postcolonial independence movements of the 1950s and after, the political implications of astronomy and geography arguably become more apparent than before (even taking into account the colonial mentality spurring these sciences in the preceding century).

Joining Duchamp’s name to astronomy and geography may seem par-



1.6. Marcel Duchamp, Notes, from *La mariée mise à nu par ses célibataires, même* (*The Bride Stripped Bare by Her Bachelors, Even*)—*The Green Box*, 1934 (mixed media).

© 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp.
Photo credit: Philadelphia Museum of Art / The Louise and Walter Arensberg Collection, 1950 / Bridgeman Images.

adoxical, considering the artist's emphatic move away from traditions of landscape painting. Rather than make art for the delight of the eye, he favored more intellectualized artistic pursuits that he characterized as “non-retinal.” Duchamp explained to interviewer Pierre Cabanne his preference for a nonretinal art; his *Large Glass*, for instance, should be experienced through the notes that accompany it and through the physical object itself (figure 1.6, plate 3). The *Glass* “must not be ‘looked at’ in the aesthetic sense of the word.”²³ Duchamp associated retinal art with traditions of modern

art stemming from the work of French painter Gustave Courbet (1819–77). “Since Courbet, it’s been believed that painting is addressed to the retina. That was everyone’s error. The retinal shudder! Before, painting had other functions: it could be religious, philosophical, moral. If I had the chance to take an antiretinal attitude, it unfortunately hasn’t changed much; our whole century is completely retinal, except perhaps the Surrealists. . . . It’s absolutely ridiculous. It has to change; it hasn’t always been like this.”²⁴ Courbet’s approach to painting, dubbed realist by his contemporaries, both expanded and challenged the tradition of landscape representation associated with academic painting since the time of French painter Nicolas Poussin (1594–1665). As director of the Académie des beaux-arts, Poussin had elevated the art of landscape painting from its previously humble status within the hierarchy of the fine arts by infusing it with intellect. Borrowing from classical theories of rhetoric, and from the aesthetics of classical antiquity, Poussin also played freely with landscape. He transformed the visual representation of landscape, subordinating the land to agree with intellectual ideals rather than remain beholden to visibly faithful depictions of recognizable sites. As the work of geographer Denis Cosgrove demonstrated, the notion of a “faithful depiction” of a place is inherently conditioned by history. Courbet replaced Poussin’s approach with another, based on the representation of recognizable places. Courbet’s landscapes set the precedent for the Impressionist painters and formed a legacy for modern art. During his mature years as an artist, Duchamp showed little interest in such a “retinal” approach to landscape as that promoted by Courbet.

Ideas from popular representations of astronomy and geography converged with Duchamp’s thinking about new forms of creation that the modern artist might produce. Although Henderson’s *Duchamp in Context* treats an expansive set of ideas about popular science, she dedicates little attention to astronomy or geography and emphasizes Duchamp’s works surrounding his *Large Glass*.²⁵ This book seeks to build upon and complement the work of Henderson and other scholars by situating Duchamp’s work in relation to the cultural contexts shaped by popular astronomy and geography within his lifetime. Popular science displays emphasized various forms of audience experience, frequently placing visitors into states of immersion that blurred the lines between spectacle and education. Through new cartographic displays, experiments in popular science museums, world’s fair attractions that simulated travel, and the distinctly modern experiences of aviation or the projection planetarium, astronomy and geography stood



1.7. Marcel Duchamp, *Fountain*, 1917, replica 1964. Porcelain. 360 x 480 x 610 mm. Purchased with assistance from the Friends of the Tate Gallery, 1999. Tate Gallery, London. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: Tate, London / Art Resource, NY.

at the forefront of innovative approaches to audience engagement during Duchamp's lifetime. Art's engagement with astronomy and geography has produced a spate of books and exhibitions acknowledging substantial interchange among these ways of thinking about, and representing, the cosmos.²⁶ Terrestrial and celestial artistic pursuits abound today, and recognition of Duchamp's significance for modern and contemporary art continues to expand.

The Artist of the Century and a Nonretinal Art of Experience

Scholars today generally agree that Duchamp remains the most influential artist of the past century. Influential arts professionals voted Duchamp's 1917 *Fountain* as the most important work of modern art in response to a 2004 survey conducted by the BBC (figure 1.7).²⁷ *Fountain* is undoubtedly the best known of the category of works Duchamp called readymades, in

which the artist's chief activity was the selection of a mass-produced object that he transformed in limited ways by adding a title, inscription, signature, or other slight modifications. For some critics, Duchamp's turn away from painting in exchange for readymades appears to have signaled the end of art, by emphasizing choice over craft and ushering in conceptual art.

Long before he abandoned painting, Duchamp had embarked upon new approaches to creation that sought to move beyond traditional definitions of art. Duchamp's shift from making singular art objects in favor of the creation of experiences has been less fully considered. Science provided context for this experiential "art" that would differ from other things exhibited as art. In a note that Duchamp later published as a part of the collection *à l'infinif*, he questioned, "Can one make works which are not works of art?"²⁸ Following Duchamp's question about the possibility for an artist to create outside the realm of art, I have chosen to refer to Duchamp designing experiences or to the category of "experience design" to avoid misunderstandings that might be brought on by reference to an "aesthetics of experience." Although modern art theorists such as John Dewey contemplated *Art as Experience*, and late twentieth-century installation artists and diverse performance artists variously traced their lineage to Duchamp, questions of art and aesthetics mostly stand apart from my analyses of the experiences Duchamp created.²⁹

This book presents Duchamp as a designer of experiences that might engage minds and bodies simultaneously. This approach does not seek to invalidate other interpretations of Duchamp and his legacy, nor does it seek to replace a history of "Duchamp the artist" with that of "Duchamp as designer." To analyze his creation of experiences presents opportunities to reconsider the received wisdom about Duchamp and understand in new ways the historical development of his work and his broader legacy for modern and contemporary creation.³⁰ Following a chronological trajectory, this book analyzes the gradual emergence of Duchamp's move toward experience design in relation to ideas and practices of modern sciences, especially geography and astronomy. Although influential in entertainments from the popular culture of cinema and the amusement park to the *Gesamtkunstwerk* (total work of art) of opera, the techniques of experience design applied equally to educational environments, especially those of science and technology museums.

Seeking alternatives to artistic traditions that he interpreted as overly "retinal" and mired in the judgment of taste codified by Immanuel Kant's

aesthetics, Duchamp turned instead to varieties of creation that could engage a viewer's intellect. Through the mediation of design practices and the investigation of ideas proffered by a changing field of modern science, Duchamp moved toward the multisensory engagements characterized by exhibition design. His quest for a "geographic 'landscapism'" led to the creation of narrative spaces expanding the landscape themes that helped to define modern art and literature. Looking at Duchamp's work through the lens of experience design, his continuing impact on recent art, especially on artists' engagement with terrestrial and celestial landscapes, shows the century's most influential artist in a new light.

Some of Duchamp's most significant creations, among them his *Large Glass* (1915–23; figure 1.2), exhibition designs (such as his design for the Exposition internationale du surréalisme, 1938; figure 5.1), or the posthumously unveiled *Etant donnés* (1946–66), created alternate worlds a visitor might inhabit. With its compositional elements sandwiched between panes of glass, *The Large Glass* presents a flatness that belies the three-dimensionality of its materials. It offers viewers a landscape to inhabit with the mind as well as the eyes. Visitors to *The Large Glass* might benefit from consulting Duchamp's collected notes as they embark upon a journey into its imaginary landscape. By contrast, a participant's sense of physical immersion in Duchamp's design for the 1938 Exposition internationale du surréalisme or the absorbing optical realism of *Etant donnés* seem more calculatedly to envelop one who experiences the work. Oliver Grau, historian of art and media, has characterized immersion as "mentally absorbing and a process, a change, a passage from one mental state to another."³¹ Such an emphasis on mental engagement is fitting for Duchamp's approach to immersion. Although immersive experiences absorb the visitor, "we are also struck by how dissimilar they are to conventional viewing settings," as anthropologist and cultural historian Alison Griffiths has remarked.³² Despite the possibilities for immersion inherent in the Gesamtkunstwerk, Duchamp's approaches have more in common with the planetarium than the theater.³³

Although Duchamp engaged an audience in multisensory experience, the five bodily senses remained messengers in support of his quest for a nonretinal art. Art historian Janine Mileaf has asserted the essential place of tactility in the work of Duchamp and his cohort, and the significance of this dimension in moving modern art beyond the privileged position of vision.³⁴ Mileaf emphasizes the tactile sense while pointing to the ways

that tactility necessarily led to viewers' multisensory engagement with Surrealist artworks. In this way Mileaf, like Caroline A. Jones and others, joins voices from an increasing number of art historians who call for attention to a more embodied sensorium that might expand forms of interpretation beyond those that privilege optical experience.³⁵

Painted Landscapes and Modern Art

According to standard histories of art published from the late nineteenth century onward, the Impressionist artists and their followers forged the basis of modern art through their innovative approaches to landscape as their subject matter and painting as their primary medium. Duchamp's fellow artists among the Cubists perpetuated this heritage, rooted in attention to the meanings of place, well into the middle of the twentieth century.³⁶ Such geographic sensibilities amongst the artists of the avant-garde paralleled the emergence of a larger popular fascination with geography that accompanied new modes of geographic education, burgeoning colonialism, and the professionalization of geography as an academic and applied discipline. At a time when the "ground truth" of the Earth and its history increasingly fascinated modern audiences, they turned their attention simultaneously to the skies and to the secrets of the universe that might be unlocked by the growing science of astronomy.³⁷ Popular amusements merged with the study and promotion of geography and astronomy, the sciences of earth and sky, in the nineteenth and twentieth centuries. Chapters 1 and 2 of this book point to varieties of popular science and their impact on visual and literary artists. By blending entertainment with the pursuit of knowledge, these modern museums of science expanded upon long-standing traditions of parlor tricks and "playful physics" in pursuit of "la science pour tous" or "la vulgarisation scientifique," as the French refer to popular science. Duchamp's practices of thinking and of making were suffused with these approaches to "science for all" that he encountered in the new science museums of his day. Visiting the Conservatoire national des arts et métiers of Paris and the Deutsches Museum of Munich in the months leading up to the autumn of 1912 prepared the ground for Duchamp's approach to experience design.

Chapter 1 focuses on the role of geography and geographers in the creation of an "experiential" type of education that ultimately promoted geographical knowledge and a broader scientific education. This chapter

treats mass culture seriously, analyzing a range of examples reaching from academic to popular geographic thought. A massive globe made for the Exposition universelle in Paris, 1900, demonstrates the cultural circulation of geographic thought. Such structures as the panorama and diorama proliferated in the late nineteenth century, offering opportunities for embodied experience that blended education with entertainment. Chapter 1 provides a critical history of popular geography in France in the time of Duchamp's youth. As such, readers interested in geography will find it easy to read independent of the remaining book. Because this chapter offers essential background, Duchamp's role is secondary in chapter 1.

Chapter 2 focuses on astronomy as a subject of art and as a provider of potent metaphors for the literary figures who inspired Duchamp. Although Duchamp named few creators whose work he recognized as influential for his own development as an artist, he repeatedly signaled the importance of the authors Stéphane Mallarmé (1842-98), Alfred Jarry (1873-1907), and Raymond Roussel (1869-1937). These literary figures fueled his desire to make an intellectually engaging art. Duchamp's conceptually based art engaged Mallarmé's injunction to depict "not the thing, but its effect."³⁸ In an era that nearly deified positivist science and its attendant faith in progress, Jarry and Duchamp worked incessantly to undermine the primacy of science. At the same time that they engaged scientific subjects, they deflated the pretensions of mastery surrounding the science of their day. If my title positions a ludic Duchamp as *Playing with Earth and Sky*, it is in the manner of a pataphysician like Jarry, for whom the stuff of science offered raw materials that artists might transform or bend at will. When Duchamp told an interviewer in 1963 "I propose to strain the laws of physics," his comments directed attention to his lifelong engagement with pataphysics and refusal to submit to a worship of science.³⁹

Chapter 3 analyzes themes of geography and astronomy related to Duchamp's readymades. This chapter seeks to understand the readymades and related works through a playfully "Duchampian" approach that considers how the readymades might stand in for the monuments of Paris, as miniaturized surrogates. This analysis reframes Duchamp's emphasis on "choice" and his disavowal of aesthetics, emphasizing the creative power to be found within acts of substitution and shifts of scale, related in part to similar actions associated with Frédéric Auguste Bartholdi (1834-1904), sculptor of the Statue of Liberty. Additionally, this chapter investigates the historical context of the Salon de l'aéronautique or Exposition de la

locomotion aérienne to which Duchamp's friends traced his rejection of painting, and the automotive, bicycle, and aviation parts from a Puteaux factory displayed there. While other artists explored aviation as a sign of modern life, Duchamp investigated its use of standardized parts—including those borrowed from bicycles.

Duchamp's practices of substitution continued into the 1920s, when he increasingly transformed his body into a work of art. Chapter 4 discusses how he used a comet-shaped haircut to "represent" a contemporary celestial phenomenon through a new medium. His related invention of a female alter ego, Rrose Sélavy, took astronomical themes metaphorically, investigating "stars" of stage and screen. I interpret this period of the 1920s as a transitional phase in Duchamp's movement toward the creation of larger experiences of embodiment—settings for group experiences—that marked his creative activities in subsequent decades. Chapter 5 examines Duchamp's exhibition designs for the 1938 Exposition internationale du surréalisme in the context of the experiential education offered by the new Parisian science museum founded the year before, the Palais de la découverte, and the new type of immersive environment experienced in its planetarium and related attractions.

The conclusion considers Duchamp's late-career challenges to landscape painting, including two little-discussed works: a readymade from 1965 incorporating cigar ashes and a poster for a 1967 Paris gallery exhibition of Duchamp's readymades and multiples. Interpreted as meditations on life and death, these works and the secret work unveiled after his death, *Etant donné*s (1946–66), speak to the transformations of the landscape tradition to which Duchamp returned across his career, challenging earth and sky.

Cultural Contexts of Astronomy and Geography for Modern Artists in France

From the time of Louis XIV, whose iconography as the "Sun King" formed a cosmologically grounded propaganda system, national conceptions of geography, astronomy, and cosmology shaped significant aspects of French culture and the sense of "French" selfhood. The power of such cosmological thought shaped the modern era in which science and nationalism became interwoven, as I discuss below. Duchamp would later extrapolate his art from the notions of measure, meter, and meridian that defined terrestrial and celestial science when the age of kings gave way to revolution. With no

need to believe in either mythic or mystic truths of science, Duchamp could borrow freely from the history of science and the new museums of science to play with earth and sky.

Duchamp's interest in popular science and science museums continued throughout his life. His wife, Teeny, recalled his love of these museums and noted that he had taken her to the Musée des arts et métiers, the Deutsches Museum, and the Palais de la découverte.⁴⁰ Jacqueline Matisse Monnier, Duchamp's stepdaughter, reflected on the popular science magazines found in his New York apartment, including *Scientific American*, or *Science et Vie* and the *Lectures pour Tous* digest at home in Paris. "When something came along in the press that he liked—a reproduction of his work—he would include it [in his working materials]. Like the *Portrait of Dumouchel* in [the magazine] *Lectures pour Tous* he sent me to buy 47 copies," she recalled.⁴¹ Duchamp could play with the stars, as in the time that he acknowledged the birth of a child who was "béné par les astres" (born under a good sign).⁴² Yet "Marcel wasn't interested in astrology," Monnier noted, "but Teeny was. No, Marcel wasn't bothered by this . . . her friends were interested, too. Chagall's wife was interested in astrology, and astronomy." So, too, were others in their artistic and social circles. Joseph Cornell (1903–72) "liked the star maps because he liked their associations with astrology, and he loved the legends," she recalled, emphasizing his passion for literature.

Duchamp's engagement with earth and sky reveals an interest shared with Cornell and their contemporaries. Cornell and Max Ernst (1891–1976) reveled in the immensely rich visual culture of scientific publications, especially those from the nineteenth century. Their interests in popular science are well documented. Both shared Duchamp's passion for playfulness, although each took his engagement with science in different directions. Multivalent imagery combined astronomy and landscape with alchemy in Ernst's wide-ranging collage creations or his paintings, such as *Of This Men Shall Know Nothing* (*Les hommes n'en sauront rien*; 1923).⁴³ Astronomy and geography offered a basis for a dynamic poetics in Cornell's art, reminding us how deeply he was anchored in the world of contemporary scientific discovery while simultaneously building an artistic cosmos organized around dreams and play.⁴⁴ Others among Duchamp's cohort shared a playful approach to astronomy and geography. For Alexander Calder (1898–1976), as for Cornell and Duchamp, cosmological thinking offered poetic and playful analogies to enrich an art made from everyday materials including industrial metals. Calder's kinetic mobiles led to his creation of

works, such as the cosmically titled *A Universe* (1934), that moved in ways he likened to the perpetual motion of the cosmic spheres.⁴⁵ During the 1940s, Calder embarked on a series titled *Constellations*—a theme that simultaneously fascinated Surrealists, including artist Joan Miró (1893–1983) and poet André Breton (1896–1966). Popular sciences of astronomy and geography offered rich resources for Duchamp’s playful contemporaries.

Duchamp’s rigorous sense of play set his work apart from the art of others among his contemporaries, such as Giacomo Balla (1871–1958), Robert Delaunay (1885–1941), and Fernand Léger (1881–1955), whose scientific interests were more straightforward. In *Mercury Passing before the Sun*, Balla translated his observation of an occasional celestial phenomenon—a partial eclipse of the sun by the planet Mercury—by painting it in the visual idiom of Italian Futurism. Despite the irreverent tone of the Futurists’ many manifestos, Balla’s painting embraces modern science and technology, especially the telescopes that made it possible to witness the transit of Mercury. As astronomer J. D. Mehl noted in an article anticipating the transit of Mercury on November 7, 1914, “Mercury is so small that its transits cannot be well seen without the aid of a telescope.”⁴⁶ Spiraling forms in Balla’s painting function on a cosmic level, as lines of force indicating celestial motion. More mundanely, these spirals may register the artist’s sensation as he peered through the barrel of the telescope. Here, the science of astronomy provided Balla with inspiration that was at once earthly and cosmic. Similarly, Robert Delaunay’s fascination with the sun motivated his early landscape paintings such as *Landscape with Solar Disk* (*Paysage au disc*; 1906–7) and his contributions to the birth of “abstract” or “nonobjective” art in paintings such as *Simultaneous Contrasts: Sun and Moon* (1912–13) and the *Disk* series (1912–13).⁴⁷

Whereas Balla and Delaunay painted aestheticized responses to the science of astronomy, Duchamp freely adapted the elements he extracted from contemporary science. Duchamp’s challenge to traditions of landscape painting continued over the course of his long career, expanding to become a series of challenges to widely accepted standards of fine art. By launching new forms of nonretinal, multisensory, and intellectual experience, Duchamp reshaped the terrain of possibility for the generations of creators in art and design who would follow. Bending and tweaking the sciences of astronomy and geography, Duchamp did not shape the fabric of the cosmos itself. Instead, he manipulated the underpinnings of science, in a pataphysical way, to play with earth and sky.

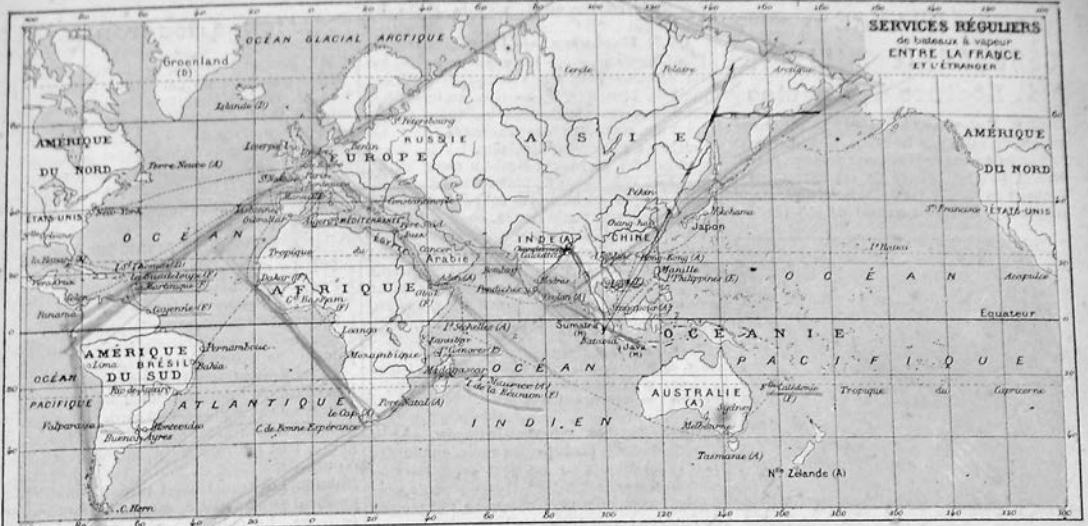
CHAPTER ONE

SPACES OF EXPERIENCE

Geography, Astronomy, and Display

• • • • • his chapter analyzes the French national culture of astronomy and geography, and its proliferation in the late nineteenth and early twentieth centuries, to present their place in the scientific education Marcel Duchamp and his cohort experienced. This standardized education, imbued with nationalism, provides essential background against which to consider the interest in mapping and spatial relations at play in Duchamp's art. Hands-on demonstrations and embodied experience characterized scientific education in both formal and popular presentations of astronomy and geography, offering a distinctly non-vicarious form of audience engagement predating Duchamp's spaces of experience and exhibition designs.

A secondary-school geography textbook stands out among the few books long preserved in the Duchamp family library and remaining in the archives of the Association Marcel Duchamp today.¹ Though well worn, the school-book bears limited marks. One page offers a curious exception, a subtle drawing from an unnamed hand depicting an unidentified form (figure 1.1, plate 4). Pencil-sketched lines mostly run at angles intersecting the coordinates of longitude and latitude that appear on this page, a map. Those lines make the world seem small as they enclose the continents of South America, Africa, Europe, and Asia. With its map titled "Grandes lignes françaises de navigation" (Great French navigation lines), the book referred to an age of ocean-borne commerce. Although one might read these penciled lines as geometric doodling, their forms take on other meanings in the context of navigation, looking like the fuselage and large wings of the early single-wing aircraft whose flights began to challenge ocean-going navigation at the start of the twentieth century (figure 1.2, plate 5). The airplane would soon challenge the geographical knowledge that this book was intended to guide.



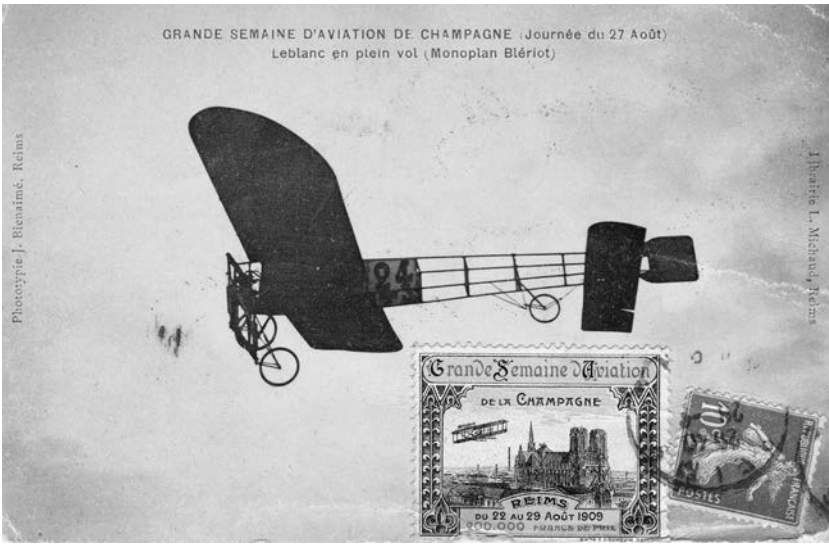
GRANDES LIGNES FRANÇAISES
DE NAVIGATION
[Suivre sur la carte]

2^o Ports français de la Manche.
De Boulogne
En Angleterre... Folkestone (8 l.), — Londres (50 l.).
De Dieppe
Narbonne (20 l.) — Londres

4^o Ports français de la Méditerranée.
De Port-Vendres.
En Algérie..... Alger (165 l. en 30 heures).
De Cette
En Espagne..... Barcelone, — Carthagène.
En Algérie..... Oran, — Djijelli et Teuz, — Philippeville et Bône, — Mostaganem, — Annas

1.1. Unidentified artist, undated pencil sketch of geometric forms or an early aircraft (monoplane) over the map “Grandes lignes françaises de navigation” (Great French navigation lines), in Pierre Foncin, *Géographie de la France*, 27th ed. (Paris: Armand Colin, 1895), 81. Archives Succession Marcel Duchamp, France.

Titled *Géographie de la France*, this standard second-year textbook by geographer Pierre Foncin (1841–1916) was successful enough to be revised through several new editions in the late nineteenth century.² Whether it belonged to Duchamp as a child cannot be known for certain, though it was the sort of book that would have been shared by many of the children in the family.³ Foncin’s geography book is characteristic of those Duchamp and others born in the last quarter of the nineteenth century would have known in youth. Tutoring in astronomy and geography constituted basic knowledge in the educational system through which the young Duchamp passed. Strong French educational traditions inculcated geographical and astronomical knowledge through a variety of means, beginning with rote memorization. Outside of formal educational settings, however, new attractions emerged that could impart experience (if not wisdom) through immediate, immersive techniques. An array of media appealed to audiences in



1.2. Postcard, Reims, “Grande semaine d’aviation de Champagne, journée du 27 août” (Aviation week in Champagne, France, August 27, 1909). Collection of the author.

the nineteenth and early twentieth centuries, promising new opportunities to experience earth and the cosmos firsthand, often through simulations and multisensory experiences.

Many different kinds of educational experiences were on offer for those who sought to learn about earth and sky in Duchamp’s time. Often, these blended education with entertainment; their legacy continues today in the traditions of experiential or “hands-on” science museums, whose origins reach back through science kits and chemistry sets to parlor games, playful physics, and even the panorama. Maps, globes, gardens, scientific performances, displays, demonstrations, and spectacles all proposed experiential and somatic knowledge of the earth sciences and astral sciences. Expanded bodily experiences of astronomy and geography flourished amidst the spectacles cultural historians Vanessa Schwartz and Alison Griffiths have referred to, respectively, as “early mass culture” and environments that promise an “immersive view.”⁴ The experiences offered by these spectacles, though dependent in large part upon viewing, provided more than mere views. Whether they emphasized entertainment, education, or the simulation of travel, their methods engaged the intellect and the emotions through multisensory somatic experience. By connecting the sensing body with the cogitating mind, these demonstrations of popular science offered

alternatives to Duchamp as he sought to engage the intellect while avoiding the approaches taken by most visual artists of his age.

Duchamp was not alone in his quest for intellectualized approaches to the subjects of science and the modern landscape. In Duchamp's era, well-funded commissions supported the allegorical interpretations of modern science painted by muralists such as Pierre Puvis de Chavannes (1824-98) and Albert Besnard (1849-1934). Duchamp moved beyond allegory to find other means of engaging viewers' "grey matter." Popular science, which sought innovative means of communicating complex ideas with ease, offered experiences that were engrossing without necessarily being *aesthetic* experiences. Duchamp's notes and interviews testify to his interest in popular science experiments, as well as carnival games and displays such as those at the Conservatoire national des arts et métiers (CNAM). There, and in his visits to the Deutsches Museum during his 1912 sojourn in Munich, Duchamp would have encountered exhibits related to astronomy, geography, and other pursuits ranging from physics to electricity and agriculture, presented through exciting new displays. In addition, the CNAM played a significant role in the creation, preservation, and exhibition of the standard meter, as discussed below. Each of these merged education with experience, at times with entertaining results. Like the geographers, artists, and creators of scientific displays examined in this chapter, Duchamp coupled scientific ideas with embodied *and* intellectual experience. Rather than create an optical simulation, which had been a major motivation since the time of Filippo Brunelleschi (1377-1446) and his Italian Renaissance experiments with linear perspective, Duchamp elaborated upon the emphasis on experiential learning inherent in popular science of the nineteenth and twentieth centuries. Inspired by the example of science museums and popular displays of astronomy and geography, Duchamp created in new, intellectually engaged, multisensory ways that distinguished his path from that of art since the Renaissance. Astronomy and geography pointed the way.

To understand the originality of Duchamp's accomplishments, this chapter first elaborates the backgrounds of astronomy, geography, and "experiential culture" in the time of Duchamp's youth and early career. Such a historical overview, which scholars have yet to compile, situates Duchamp's works within the contexts of the popular sciences of astronomy and geography of his time.

Geographical education for French children became commonplace by the closing third of the nineteenth century. Geography taught French children



1.3. Jean-Léopold Boilly,
The Geography Lesson, 1812.
Oil on canvas, 29 x 23¼ in.
(73.6 x 59 cm). Collection of
the Kimbell Art Museum,
Fort Worth, Texas.

their place in the world. Driven by nationalistic goals, French geographic education affirmed the importance of each provincial region that composed the nation, while confirming their place as citizens of France. From the six-sided appearance of the French nation's landmass as represented on maps, the geometric term "hexagon" was appropriated to represent France. Capitalized as *l'Hexagone*, the nickname referred to the nation-state bordered by other European nations. In this way, as French colonial interests expanded during the nineteenth century, the Hexagon could be distinguished from the "Greater France" encompassed by colonies, mandates, and protectorate territories worldwide.

Before the mid-nineteenth century, geographical education was likely to be a lesson in the course of empire as seen in the painting *La leçon de géographie* (*The Geography Lesson*) (1812) by Jean-Léopold Boilly (1761–1845; figure 1.3). Combining portraiture with genre scene, Boilly depicted his friend Gaudry accompanied by the maps and globes with which he instructed his daughter.⁵ Boilly's painting adapted a recognizable theme from seventeenth-century Dutch paintings such as Vermeer's *Geographer* (1668–69), expanding the earlier painting's emphasis on a quiet interior with a scene of family life.⁶ Following the traditions of portraiture, Boilly

chose as attributes the tools of geographic education, adding commentary on the social status of the sitters to complement the visible wealth of their fashionable clothes.⁷ On the desk beside Gaudry's maps and atlases, a globe clearly shows the Atlantic Ocean and the continents of Europe, Africa, and the Americas on which one might trace the dreams of Napoleon's expanding empire.

Boilly's painting offers a glimpse into geographical education within a well-appointed home of a high-ranking government official, a member of the bourgeoisie. In schools, French geographic education of the modern period was keyed to the map. Maps and globes have held a special place in French culture at least since the time of Louis XIV. Louis established and performed his identity as the Sun King through elaborate systems of iconography, cosmologically inspired, that coursed through poetry, theater, and other writings as well as the design of gardens, palaces, globes, and maps.⁸ Cosgrove demonstrated how the iconographic program of the Sun King, as elaborated in the constructed landscape surrounding the palace at Versailles, related to contemporaneous developments in cartography and connections between burgeoning scientific studies of the Earth and astronomy.⁹

The cosmic significance of Louis's iconography related to practical matters of politics and of science that led to the establishment of the Paris Observatory in 1667. L'Observatoire de Paris played a significant role in the development and diffusion of earthly and celestial sciences. From the observatory, French endeavors to standardize time, weights, and measures were recorded and disseminated through scientific publications that fed a growing audience for popular science. Duchamp's art would challenge such standardization, as I discuss below. The epicenter of this new knowledge, l'Observatoire de Paris, made headlines in the international popular and scientific press throughout Duchamp's lifetime. When in Paris, he walked frequently past this place while coming and going from the apartment of his close friend Henri-Pierre Roché (1879–1959) at 99, boulevard Arago, opposite the observatory's gardens in the fourteenth arrondissement of Paris.

The Map as Monument:

Mapping the Hexagon, Visualizing the Globe

Duchamp was raised in a cultural climate that celebrated maps as national treasures. Such was the case of the "Carte de la France," the first complete map of France (figure 1.4). Better known as the "Cassini" map, its long



1.4. Overview map, or “Tableau d’assemblage,” of the “Carte de la France,” also known as the Cassini map (“Nouvelle carte Qui Comprend les principaux Triangles qui servent à la description Géométrique de la France levée par ordre du Roy [New map showing the use of triangulation for the geometric description of France, drawn up by royal decree]), 1744. Collections of the Bibliothèque nationale de France, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.

genesis began in the mid-1700s. Figure 1.4 shows the 1744 “Carte d’assemblage,” based on data gained through a triangulation survey of France. Created by four generations of the Cassini family, the work was completed by Jean-Dominic, Comte de Cassini. He was generally known as “Cassini IV” to distinguish him from the long lineage of astronomers and geographers in his family. Son of the head of l’Observatoire de Paris, Cassini IV followed his father in leadership of the observatory and promoting its significance as an international center of scientific measurement.

Geographer Anne Godlewska has discussed the contested ownership of the Cassini map, made by the Cassini family yet claimed by Pierre Jacotin (head of the *Dépot de la guerre* and its topographic services) on behalf of the nation. “A map of France was ‘a national monument,’ above the interests and claims of individuals,” contended Jacotin, despite Cassini’s assertion that the map was based on the accumulated labor of several generations of

his family and thus was his own intellectual property.¹⁰ Jacotin's claims for the status of the Cassini map as a monument would be repeated into the twenty-first century, emphasizing its cultural significance.

Cassini's map was monumental in every way. It was the product of a monumental effort to survey all of France. This surveying work contributed to the standardized measurement that would later interest Duchamp. Thanks to the mathematical expertise of the Cassini family, and their experience in astronomy and geography, the mapping expedition employed the most sophisticated measurement technologies of its time, including the latest precision optics, theodolites (for the measurement of angles essential to triangulation), and other measurement tools.¹¹ International cooperation with the UK contributed to improved measurement along the English Channel. Systems of triangulation across the French landscape were used to complete the geodetic survey with precise measurement.

In a physical sense, the immense size of the Cassini map meant that it was monumental like no existing map before it. Comprising 181 engravings published between 1750 and 1815, its sheets were sometimes bound into volumes as atlases. When pieced together on a flat surface, in a puzzle-like fashion, the collected sheets cohered to form a map of France measuring some thirty-nine feet high by thirty-eight feet wide.¹² A scale of one *ligne* to one *toise* in the old measure, equivalent to 1:86,400 today, meant that it displayed the topography of France in greater detail than any previous map.¹³ A large map with heightened detail was obviously more revealing than smaller and less precise maps, as both trained and untrained viewers could recognize. Constructed on the basis of carefully collected measurements and scientific observation, the Cassini map proved itself to be dependable on the ground as well. Cassini's "Carte de la France" inspired later efforts to make monumental maps and globes that would engage and educate through their scale and detail.¹⁴ In later years, as tourism developed across France, hikers, bicyclists, and automobilists would benefit from the many variations on the "Carte de la France," with individual sheets or maps that could connect to one another to make clear a continuous path. Duchamp would later adapt such maps to forge a playful geography.¹⁵

Collecting and Displaying Maps for the Nation

Maps' significance as national monuments grew throughout the modern epoch. The term "cartography" itself emerged in the nineteenth century, as

did a rapidly burgeoning interest in the history of cartography.¹⁶ Although the historical study of maps remained largely separate from contemporary cartographic designs and production, the interest in history gave rise to exhibitions, periodicals and publications, and even facsimile editions dedicated to historical maps throughout the decades of Duchamp's life. As historian of cartography J. B. Harley has noted, "this interest was to continue with an unbroken lineage into the present century. Its principal driving force, especially after 1850, was the rise and institutionalization of geography, together with the growth of specialist map libraries and—in Europe and North America—the development of a distinctive antiquarian map trade . . . the history of cartography was not studied then as an independent subject but remained primarily a handmaiden to the history of geography defined as the history of geographical discovery and exploration."¹⁷

Major exhibitions featuring historical and contemporary maps held throughout the nineteenth century in France, as elsewhere, promoted the idea of the map as a national monument. In Paris, the national library had amassed enormous collections of maps and geographic material under the kings of France, when it was known as the *Bibliothèque Royale*. To these treasures the newly named *Bibliothèque nationale*, born of the French Revolution, added the libraries of nobility and clergy whose collections (like their lands) were claimed by the revolutionary state in the name of the people. Later, under Napoleon, additional geographic and cartographic collections were claimed as the spoils of war, or added through the increasing bureaucratization of the new nation. During his tenure as head of the library's map room, Edmé-François Jomard (1777-1862) was foremost among those in France who promoted the new study of historical cartography. Jomard, who trained at the *Ecole polytechnique* before working as engineer, geographer, and cartographer for the Napoleonic expeditions in Egypt, contributed significantly to the encyclopedic project of the *Description de l'Égypte* (published between 1809 and 1829). Jomard advanced the status of historic maps significantly. He promoted the facsimile publications of medieval maps from the collections, engaging in public debate about their significance.¹⁸ In a bureaucratic shift, the library moved control over its collections of cartography from the *Département des estampes* to the *Département des imprimés* in 1830, classifying them in a subcategory known as the "Section des cartes et collections géographiques."

Because the French national library held the world's first major collection of maps grouped for their historical significance, their exhibitions were

especially numerous and significant. Since Jomard's time, the bibliothèque has featured occasional exhibitions dedicated to historical maps and other cartographic treasures from the library's collections, such as the 1875 exhibition dedicated to the history of geography mounted at the library.¹⁹ In this instance, the library's exhibition was designed to complement the meetings of the International Congress of Geographical Sciences and its "Exposition de géographie" staged in nearby venues.²⁰ The International Congress was a major event, with an array of speakers, events, and exhibits. One geographic society's journal, *L'Explorateur*, reported that a crowd of some six thousand people gathered for the ceremonial opening of the congress on Sunday, August 1, 1875. With this exhibition, held in a dramatic venue, the Société de géographie showcased contemporary French geography. A mob of angry citizens had burned the palace during the Paris Commune some four years earlier. In its ruined state, the Tuileries venue offered a poetic setting against which an array of geographic objects and equipment were displayed. In the more official setting of the Bibliothèque nationale, the library's director Léopold Delisle (1826–1910) promoted a parallel exhibit of the history of geography. Delisle's associate Eugène Cortambert (1805–81), keeper of the national map collection, brought together materials from across the library's departments. At the center of the exhibition stood two monuments of cartography and of French history, the "Grandes Globes" of the terrestrial and celestial spheres made by Marc-Vincent Coronelli (1650–1718) for Louis XIV in 1683.²¹ Their monumentality was impressive, for each globe spanned nearly four meters in diameter. Relics of an age of monarchy, these great globes assumed new power in the Republic. Elements of cartography and geography continued to play a considerable role in the international exhibitions of the century that followed.

Although the powerful presence of these geographical artifacts has been acknowledged in a general way, cartography's place in specific exhibitions and pavilions of world's fairs merits further consideration. In French publications' reviews of the fair participants' pavilions, cartography was frequently singled out for the variety of ways that maps were used to represent the physical geography and the industrial and cultural landscapes of the nations on display. Cartography's significance for the fairs should come as no surprise, given the ideological narratives promoted by maps and by the exhibitions themselves. By representing each nation on a smaller scale, the map permitted its territory to be exported, virtually, to the fairground site. Maps took their place alongside displays of a region's raw materials and



1.5. Josef Löwy, photograph of the Pavillon de la ville de Paris, Vienna Exposition, 1873. Albumen paper print from gelatin silver bromide glass negative, 12 x 17 in. (31 x 44 cm). Collections of the Bibliothèque nationale de France. Photo credit: Département de la reproduction, Bibliothèque nationale de France.

finished products ranging from the wares of artisans and local cooks to the industrial goods that testified to modernization and the promise of economic growth.

International audiences visiting Paris to attend the Expositions universelles encountered similar exhibits on site at the fair, where they were expanded to attract the diverse visitors' interests. At the 1878 expo, for instance, historic maps appeared alongside newly commissioned maps, models, and photographs in the Paris Pavilion (figure 1.5). Long ago, the photograph by Josef Löwy (1835–1902) shown in figure 1.5 was mistakenly labeled as documenting the 1878 expo; more recently, it has been reattributed as showing the Paris Pavilion during the Vienna Exposition of 1873. Löwy's photograph demonstrates the harmonious coexistence of art, cartography, and public works inside the pavilion. Large maps of Paris stand out from across the room, glimpsed beyond a sculptural group for a

public fountain.²² Beside the sculptures, small revolving racks displayed works on paper such as photographs or architectural drawings. Such racks were commonly employed in late nineteenth-century exhibitions. Duchamp's decision to mount artworks on revolving glass doors for the 1938 Surrealist exhibition, discussed below, was thus anchored in standard exhibition practices he updated with tongue-in-cheek irony. Similar devices for presenting works on paper were likely employed to display the photographs of Charles Marville (1813–79) documenting the transformations of Paris.

Marville's photographs of Paris featured in what may have been their first large-scale public viewing during the 1878 exhibition, in an exhibition space similar to that of the 1873 Pavilion in Vienna. The later Paris Pavilion (1878) offered the first public display to demonstrate the concept of the "rephotographic survey," a technique that would become a useful tool for geographers and Earth scientists.²³ Following this technique, one analyzes multiple photographs taken over time, on the same site, from the same point of view, to determine how the images may have documented landscape change.²⁴ Working for the city of Paris, Marville documented the destruction and new construction encouraged by Napoleon III and Baron Haussmann. Marville's Paris photographs, with their haunting views of a lost Paris, later enchanted Duchamp's fellow Surrealists. In the photos' earliest exhibition, their focus on individual streets and structures demonstrated abrupt changes that complemented the slower transformations shown cartographically by the collection of historical maps displayed alongside them in 1878.²⁵ Visitors to the Pavillon de la Ville de Paris encountered these maps and photographs interspersed with paintings, statues, and scale models nestled side by side within an elegantly organized small space.²⁶

Geographic Education and Nationalist Sentiment

French schoolchildren's geography lessons were exercises in memorization in which the map served as a mnemonic key. A child's memorization of place-names, peoples, and languages, and the raw products or industries found in specific places, would be recalled in a classroom call-and-response exercise. This was especially true of the educational system set in place by the French Republic in the 1870s and continuing throughout Duchamp's time at school.

La leçon de géographie, ou la tache noire (*The Geography Lesson; or, The Black Stain*; figure 1.6), a work by the French painter Albert Bettanier, il-



1.6. Albert Bettanier, *The Geography Lesson (The Black Stain)*, 1887. Oil on canvas, 43½ x 59¼ in. (110.5 x 150.5 cm). Collections of the Deutsches Historisches Museum, Berlin.

illustrates geography's significance in modern public education and its distinctly political meanings for the French Republic. In this painting, first exhibited in the Salon of 1887, pedagogical charts and maps appear ranged upon the walls of a schoolroom Bettanier depicted. Unlike Boilly's 1812 painting of *The Geography Lesson*, discussed above, showing an intimate educational moment, Bettanier's salon painting emphasizes the Republic's drive to educate and mobilize the masses. A map featured prominently in Bettanier's painting resembles the classroom charts and maps issued to the public schools by the Ministry of Education under the leadership of Jules Ferry in the 1870s and '80s.²⁷ In these so-called Ferry maps displaying France and her regions, the mapmaker blackened the territories of Alsace-Lorraine, long contested, and taken from France by Germany in the wake of the Franco-Prussian War of 1870–71. Bettanier painted the instructor, pointer in hand, directing attention to Alsace-Lorraine. By titling the painting "La tache noire," Bettanier associated the lost territory with a stain on French national honor. Reporting on the salon in early September, well after its May 1887 opening, the art critic Firmin Javel singled out Bettanier's work for consideration:

There is always a patriotic sentiment in M. Bettanier's compositions. This artist has taken it upon himself to remind us, ceaselessly, of the burden imposed upon the nation to recapture our dear, lost provinces. Soberly, without excitement [*sans emphase*], he shows us the dark stain that today dishonors the map of France. He has set his painting in a schoolroom. A large map of our country hangs upon the wall. An instructor delivers the geography lesson to students who listen attentively. With a profound sadness, an admirably expressed sincerity, the humble schoolmaster explains to these young students the terrible meaning of this black stain that spreads across the eastern lands. The little ones, already serious like children to whom one has spoken of the sufferings of their mother, gaze upon the horrific stain. In their intelligent eyes one sees something like the lightning-bolts of revolt, and one glimpses in their spirits the revenge that is to come.²⁸

Javel's extended ekphrasis signaled the nationalist sentiments of the painting and its initial reception, animating the schoolchildren with the fires of revolt and revenge.

The art historian Richard Thomson has elaborated the context in which this painting was first exhibited, one of growing public support for the politics of revenge (*la revanche*) promoted by the French general Georges Boulanger, whose goal was to retake Alsace-Lorraine. As Thomson notes, these maps "clearly identified the lost provinces as neither French nor German. Their dark, different colouring gave Alsace-Lorraine a deliberately indeterminate quality: not (yet) German and not (any more) French. That cartographic anomaly was a visual means of allowing a situation that was solid in *de facto* political terms a fluidity in the more emotive spheres of nostalgia and nationalism. Like a public monument or a painting, the regulation map could be read variously, according to the bent of the schoolteacher."²⁹ Such maps remained in use throughout Duchamp's education and reinforced the agendas of French nationalist politics into the twentieth century. The art historian Romy Golan has demonstrated that the reannexation of Alsace-Lorraine following World War I was "one of the most tangible accomplishments of the victory in 1918. According to *revanchiste* rhetoric, the loss of these provinces had left France amputated on its northeastern front. With their return came the reconstitution of *l'Hexagone*, the often-invoked term for France's six-sided configuration on the map. What had been mutilated was now

restored; the body of France was made whole.”³⁰ French national identity focused on the form it occupied on a map of nations, that of the hexagon. Maps depicting the *tache noire* of loss after Alsace-Lorraine was excised from the nation in the Franco-Prussian War insinuated deep feelings of injustice into a young person’s education and their initiation into French citizenship.

Where Bettanier’s painting drew attention to the schoolroom’s maps, an earlier iconography of geographic education, such as that glimpsed in the Boilly portrait, persisted forcefully alongside this new geographic education. The older tradition emphasized that the study of geography was accomplished through personal engagement with the tools of geography at an intimate scale. Globes, maps, and atlases could be consulted in the comforts of the drawing rooms of the bourgeoisie and nobility who could purchase such objects. During the eighteenth and nineteenth centuries, the production and distribution of globes, maps, and atlases in limited editions paralleled the commerce in prints, sculptures, and art objects that were produced and distributed as limited editions. Bettanier’s composition, by contrast, shows the educational encounter with geography distributed among many students. Ferry’s educational reforms capitalized on changing means of production to bring geography to the masses. Bettanier’s painting depicted the standardized maps designed for classroom use and mass produced to satisfy the educational reforms of the Third Republic.

New textbooks of geography, made affordable through the use of inexpensive papers and cheaper printing technologies, replaced the limited editions from an epoch of royalty. Books such as Foncin’s *Géographie de la France* and Augustine Fouillée’s *Le tour de la France par deux enfants*, titles that were reprinted or revised many times over, brought geography into the hands of French youth. Driven by a desire to foster new patriotic messages in the hearts and minds of the young citizens, these works appear to have been highly effective in the education and indoctrination of generations educated in the years following the Franco-Prussian War. Yet these methods were complemented by other attempts to capitalize on geography’s popularity and significance in the nineteenth century. Driven by spectacle and entertainment that sometimes surpassed their educational mission, the varieties of panoramas, georamas, great globes, and other attractions popular among nineteenth-century French audiences presented geography on a scale to immerse the masses.³¹

From an early age, Duchamp would have encountered popular sciences,

including astronomy and geography, in publications at home and at school. New reproduction technologies in the late nineteenth century led to a proliferation of popular illustrated magazines, many of which gave pride of place to geography. During the years of Duchamp's childhood, the appearance of such periodicals accelerated in response to audience demand for their mixture of information and images. Publications such as the *Tour du monde* and *L'Illustration* chronicled news from around the world and featured remote or exotic locales as the subjects of their illustrated reports.³² Illustrated magazines intended for audiences of children or families similarly fostered awareness of worlds outside one's own community, prompting interest in cultural and physical geography from a young age. These widely read publications effectively promoted geographic education, in much the same ways that *National Geographic Magazine* would do later for audiences in the United States. A visual culture of popular geography emerged in the nineteenth century, offering a proliferation of views of the world that ranged from mechanically reproduced photographs to fanciful painted scenes reprinted as lushly colored oleographs and chromolithographic prints. Cornell and Ernst—to name but two of Duchamp's associates—returned in adulthood to cut up and reassemble nineteenth-century scientific and geographic books such as those whose distinct visual properties once attracted their youthful attention.³³

A Place in the Cosmos: Integrating Astronomy and Geography in Modern Education

Foncin's *Géographie de la France* opens with a broad view, stepping back to analyze the Earth situated in the cosmos. The Earth, Foncin points out, is an *astre*, a word often translated as "star," which refers to a wide variety of celestial bodies such as stars ("étoiles"), satellites, and comets. Although these also qualify as *astres*, the Earth's status as a planet distinguishes it from them and thus sets the stage for Foncin's terrestrial focus. The content of Foncin's first pages characterizes a standard approach in late nineteenth-century popular scientific writing and education, in which astronomy and geography were integrated. Foncin's influential works were typical of most geography books written in this period. In these, a student of geography would first consider the planet's larger relationship to the cosmos before studying the Earth and its inhabitants. This trope extends a consciousness that dates to antiquity, though its resurgence in modern times

testifies to the significance of natural scientist Alexander von Humboldt (1769–1859) and his highly influential publication, *Kosmos* (1845–62).³⁴ Across the five volumes of *Kosmos*, as his biographer Lotte Kellner noted, Humboldt sought to “give a scientifically accurate picture of the universe which would attract the general interest of the educated public and communicate some of the excitement of scientific study to the non-scientific mind.”³⁵ This picture depended on Humboldt’s universalizing vision, integrating a network of relationships among all the physical sciences from botany and zoology to meteorology and astronomy. Humboldt’s universalizing approach transformed popular and scholarly geography in the nineteenth century, including his impact on the anarchist geography of Elisée Reclus (1830–1905), discussed below. As a trope, Humboldt’s movement in two directions—outward from the individual to region, globe, sky, and back again—became a recurrent feature of popular education from geographic schoolbooks to planetarium shows.

In ways both serious and playful, an artist might call upon astronomy and geography to promote a meditation on the human condition through a consideration of the individual’s place in the cosmos. One such application appeared early in James Joyce’s novel *A Portrait of the Artist as a Young Man* (1916), when the protagonist Stephen Dedalus sat at his school desk puzzling over the nature of a kiss. Too distracted to memorize American place-names, Dedalus pondered an inscription he had previously written inside his geography textbook.

He turned to the flyleaf of his geography and read what he had written there: himself, his name, and where he was.

Stephen Dedalus
Class of Elements
Clongowes Wood College
Sallins
County Kildare
Ireland
Europe
The World
The Universe

That was in his writing; and Fleming one night for a cod had written on the opposite page:

Stephen Dedalus is my name,
Ireland is my nation,
Clongowes is my dwellingplace,
And Heaven my expectation.

He read the verses backwards but they were not poetry. Then he read the flyleaf from the bottom to the top until he came to his own name. That was he; and he read down the page again. What was after the universe? Nothing. But was there anything around the universe to show where it stopped before the nothing place began?³⁶

In Joyce's novel, a young boy's engagement with his geography lesson book led to meditations upon the aesthetics of the sublime (the immensity of the universe and the tininess of the individual), theology (the nature of God), and civics (the factionalism of partisan politics), within the space of a few paragraphs. This expansive range of references in Joyce's passage links it to Humboldt's universalizing *Kosmos* and to contemporary educational standards in the late nineteenth and early twentieth centuries.

Scholars including geographer Denis Cosgrove and historian of science E. G. Forbes have demonstrated how the integration of astronomy with geography became institutionalized through the eighteenth-century practices of "mathematical cosmography" that fueled modern cartographic thought and practices.³⁷ As Cosgrove notes, "For most of its history in the West, Geography was inseparable from cosmography, the science whose responsibility was to consider the Earth in its totality, unity, and structure. Cosmographers viewed the Earth from the perspective of the Heavens, the two parts together making up 'the World.'"³⁸ Mathematics offered rational tools with which to make sense of earth and sky in their totality. Indeed, the mapping of earth and sky depended upon the systems of measurement developed in the eighteenth century that included the standardized meter and the establishment of the metric system. In documents produced for the use of experts and amateurs alike, maps of the Earth and the stars offered a starting point for understanding the place of the individual in the cosmos and for journeys outward from familiar territories.

In schools, geography textbooks such as Foncin's *Géographie de la France*, discussed above, took their place amidst the increasingly standardized national curricula enacted under Ferry's historic transformation of the French educational system. As minister of public education in the 1880s, Ferry promoted compulsory education through legislation and governmental man-

dates. Geographical education played a central role in Ferry's educational reforms. Indeed, the study of geography contributed to the self-definition of the French nation in Ferry's Republic. Key texts such as *Le tour de la France par deux enfants* (1877), a standard textbook, worked to reinforce a sense of national identity and pride; geography helped to naturalize a sense of civic duty that extended to a duty to the very dirt of the nation, the landforms beneath one's feet.³⁹ As a primer of republican French values, the significance of *Le tour de la France par deux enfants* was enormous and propelled by great popularity. Over a million copies were sold in its first decade in print, nearly six million copies were sold before 1900, and over 8,600,000 copies of the book were sold in the century following its initial publication in 1877.⁴⁰ The 287th edition, published in 1900, included two pages preceding the text to indicate how the book conformed to the Ferry-inspired legislation of 1882. Basic lessons in natural history and the physical sciences appeared in the text, interwoven with lessons regarding morality, civics, agriculture, and the geography of France.

In *Le tour de la France par deux enfants*, a narrative unfolded around the adventures of two brothers, André and Julien. The book's narrative format integrated geography with history, while emphasizing the social, cultural, and intellectual contributions of great men ("grands hommes"). As the book noted, "knowledge of the land (*la patrie*) is the foundation of true instruction in civics. . . . By grouping together all forms of moral and civic knowledge around the idea of France, we wanted to present to the children their country as seen through its noblest traits, and show them how its greatness is achieved through a sense of honor, labor, and the deep respect of duty and justice."⁴¹ Astronomy appeared early amidst the book's lessons on cultural and physical geography, in a short chapter about the constellation Ursa Major and the pole star. "Thanks to this star one can always find one's way at night," one brother instructed the other.⁴² Identifying the pole star, the guiding light for celestial navigation, the boys quickly gained their bearings and set off to discover the identity of France and, thereby, their own identity as citizens of the Republic.

The astronomical lesson of the pole star is a significant point of departure for a text driven by geography. Through celestial navigation the brothers oriented themselves and thus launched their subsequent exploration of the French nation. The illustration communicated the star's location in the night sky, while caption and text reinforced the pole star's importance for celestial orienteering. Here, the celestial "starscape" helps to launch the discovery of

the terrestrial landscape. The strongest messages of *Le tour de la France par deux enfants* are geographical. The book sought to instill in young readers a spatial dimension of memory grounded in the physical landscapes of France.⁴³

Duchamp's geographic education undoubtedly included some measure of the Third Republic's politicized geography. It also included aspects of geography redolent of exploration and of nature's cultural dimensions. Duchamp studied geography at the Lycée Corneille in Rouen, a school that boasted a roster of renowned past graduates including natural historian Jacques-Henri Bernardin de Saint-Pierre (1737-1814), author Gustave Flaubert (1821-80), and modern artists Jean-Baptiste Camille Corot (1796-1875) and Eugène Delacroix (1798-1863). Duchamp studied both geography and history under professor Edouard Guillon.

Charged with the task of presenting the address for the school's awards ceremony in 1903, Guillon chronicled shifting ideas about Nature from antiquity to modern times.⁴⁴ In his remarks, Guillon narrated a then-standard view of cultural geography: beginning with the ancients' strong ties to Nature; transitioning to a separation of Man and Nature in medieval times; Nature's reappearance in the Renaissance; its transformation during the reign of Louis XIV (thanks to his scientists, garden designers and hydraulic engineers); and its culmination in the Enlightenment resurgence of a sentiment for Nature as seen in the works of Jean-Jacques Rousseau, Bernardin de Saint-Pierre, and Chateaubriand. These Romantic authors chronicled their observations of Nature in ways that embraced contemporary political and scientific theories, while simultaneously writing poetic novels set in the wilds of Nature.⁴⁵ Emphasizing the possibility for new discoveries to be made in geography, Guillon remarked,

But should we really claim to know all our scenic treasures, when the assemblage of Montpellier-le-Vieux, the wonderful gorges of the Tarn and the limestone chasm of Padirac have only recently been discovered? Today there remain only a few places in Asia and some river valleys in Africa where intrepid explorers persist in seeking rare plants, unknown fish and the Legion of Honor. . . . But enough for today. It is time for the prize-giving which you have been awaiting. . . . As for the short geography lesson which you have just heard, you will easily forgive it, knowing that it is the last.⁴⁶

Although Guillon's lecture was the last formal geography lesson for the assembled students as the summer of 1903 began, sources outside the class-

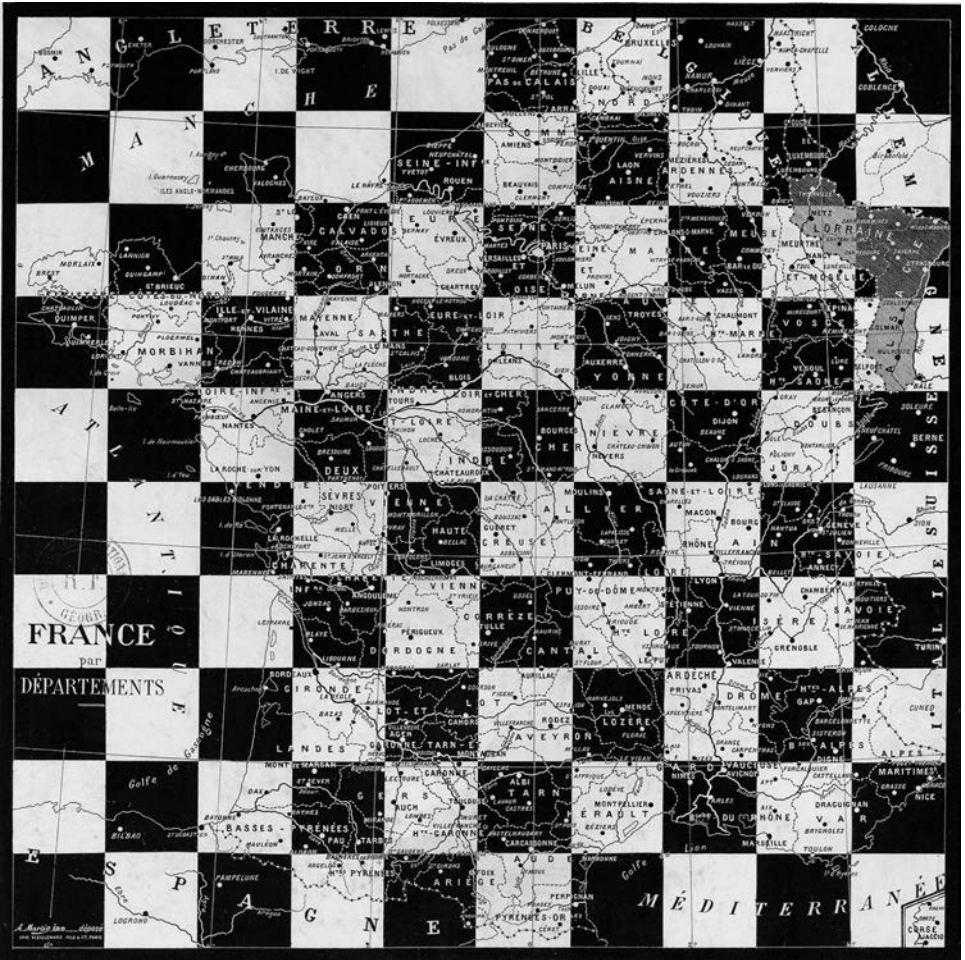
room likely had a greater impact on Duchamp's thinking about geography and the cosmos.

Great Globes and Grand Maps: Scale, Power, Meaning

Maps and globes always speak with political power. Since at least the time of the Sun King, Louis XIV, these cartographic forms have played an exceptionally powerful role in French culture as vehicles for disseminating knowledge in experiential or embodied forms while buttressing reigning ideologies. Maps stake claims on the territories they depict. A map from 1898 from the cartographic collections of the Bibliothèque nationale stands out in this regard. This “Carte de la France par départements,” published by Vieillemard in Paris, 1898, depicts the “Hexagon” of France in the form of a chessboard (figure 1.7). Like many lithographers of the day, the Vieillemard firm specialized in the cheap color chromolithographs so common in the fin de siècle and printed a range of materials, from calendars and product labels to postcards and maps such as this. The history of this firm, and of “chessboard” maps like this example, remain to be written. Yet this example remains intriguing on many levels: its form as a game board opens the viewer to a direct engagement that is inherently tactile and, as a game of chess, simultaneously intellectual.⁴⁷

Cartography has long sought to present forms to serve as surrogates for the embodied experience of terrestrial and celestial spaces. Makers of maps and globes perpetually consider questions of scale, as do artists and designers, each conscious of the impact fostered by shifting relationships between an audience and a map or object. Twentieth-century Argentinian author Jorge Luis Borges famously addressed this relationship between map and territory in his dazzlingly short story “On Exactitude in Science.”⁴⁸ In fewer than 150 words, Borges wove a mythic tale about cartographers' questionable achievement in fabricating “a map the size of the empire,” at the scale of 1:1. In their attempts at increased cartographic precision through mapping at a closer scale than previously achieved, two maps of France—the Cassini map and its successor, the Carte d'état-major—simultaneously increased the possibility of the embodied experience of landscape through maps. Scale functioned similarly in the nineteenth-century popular reception of two monumental globes initially made for Louis XIV.

In its precision of scale, the Cassini map (discussed above) advanced French cartography tremendously. With a glance, military leaders or royal



1.7. Map of France in form of a chessboard, “Carte de la France par départements,” published by Vieillemand, Fils, lithographers, 1898. Collections of the Bibliothèque nationale de France, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.

engineers could survey terrain that would have taken days to cross on horseback. Government officials needed maps for military and bureaucratic purposes. Although the Cassini map was completed in the eighteenth century, intellectual property disputes and technical delays slowed its production and availability.

A second project to fully map France led Napoleon Bonaparte to commission the Carte d'état-major (completed 1818). The original Carte d'état-

major assembled 978 hand-drawn sheets to represent France on a scale of 1:40,000 (one millimeter to forty meters). Because limited resources made precise reproduction of color documents on such a magnitude impractical, plans for the 1:40,000 scale version were set aside.⁴⁹ The largest version published was at a scale two times smaller, 1:80,000, a minor improvement upon the scale of 1:86,400 that distinguished the Cassini maps. Beautifully printed from etched copper plates, this edition remained impractical and unaffordable, restricting its use primarily to military and government officials. Survey data from the *Carte d'état-major* formed a base from which smaller-scale maps could be printed in books that were inexpensive and portable enough to satisfy the needs of average citizens.

When, in 1875, the *Bibliothèque nationale* opened its exhibition on the history of geography discussed above, the lynchpin of the exhibition was the stunning pair of monumental globes by Coronelli.⁵⁰ The Coronelli globes had been commissioned by Cardinal César d'Estrées (1628–1714), abbot of the Abbey of Saint-Germain-des-Prés, to curry favor with Louis XIV. The positions of the planets and constellations on the celestial globe corresponded to their place on the day of the king's birth. Coronelli's globes had journeyed from court to the king's chateau at Marly, where they were housed in specially designed pavilions flanking the royal gardens until 1722. Though briefly housed in the Louvre palace, they had been transferred to the royal library by 1725; there, they could be consulted by the growing membership of royally patronized scientific societies. By 1731 the globes were given a place of prominence spanning two levels of the building, where they remained through the nineteenth century. Visitors could observe the globes from below, from the lower level, or by ascending they could take in the upper half of the globes. The architecture was thus designed to facilitate active movement on the part of the visitors as they engaged with the globes.

As art historian Paula Young Lee has observed, Coronelli's globes inspired the visionary French neoclassical architect Etienne-Louis Boullée (1728–99). Since antiquity, paired globes of earth and sky marked the entrance to libraries, their presence registering with tangible form the human quest for comprehensive knowledge of our earth and of the greater cosmos.⁵¹ Within this context, the gift of Coronelli's globes can be understood as acknowledgment of the king's omnipotence and wisdom. By connecting the history of Coronelli's globes, housed within the *Bibliothèque du Roi*, to Boullée's 1788 plans for a new royal library, Lee's impeccable scholarship makes sense of the Atlantes supporting a celestial globe that framed the

library's entrance in Boullée's designs. Unlike its celestial pair, the terrestrial globe is not explicit in Boullée's architecture. I suggest that his design of an enormous, unbroken barrel vault for the ceiling can be related to the center of the Earth. His architecture thus would have transported the viewer—physically, yet also metaphorically—to the interior of the terrestrial orb. Surrounded by books, the visitor could achieve direct contact with the sum of human knowledge. This experiential quality connects Boullée's library project to the Coronelli globes and the larger history of experiential education discussed below.

Experiential qualities mark the design for which Boullée is best known today, the *Cenotaph for Sir Isaac Newton* (1784). Although never constructed, the *Cenotaph* remains highly influential. Boullée's design for the memorial implemented a logical conclusion of Newton's scientific thought: that humans might master the control of day and night. Boullée's plans demonstrate this by substituting night for day. That is, exterior daylight would have produced the effect of a starry night inside, causing the interior dome of the *Cenotaph* to simulate starlight through the passage of sunlight through the holes in its vault. This gives the illusion of the dome of heaven so often reproduced in religious architecture, here transferred to a distinctly secular celebration of modern science. An effect of day would be generated by light emitted from a sphere suspended at the center of the vault, a pale "sun." Had the structure been completed, the *Cenotaph* would have offered a distinct experience of cosmic forces on a scale far beyond that of Coronelli's globes. As many have argued, the *Cenotaph* offers one prototype for the modern projection planetarium characterized by opportunities for immersive experience.

Cartography offered immersive experiences through the increasingly detailed scale of maps such as those of the Cassini family and the *Carte d'état-major*. Because of their great size, Coronelli's globes amplified this immersive quality. These large-scale works engaged viewers' bodies as well as their imaginations in ways that had not been previously possible at the intimate scale of handheld maps and atlases. Nineteenth- and early twentieth-century audiences found increasing levels of immersion in new entertainments such as the panorama and its many variations that promised to combine education with entertainment.

Simulation and Embodiment:
From Daguerre's Goat to the Moon

The literary historian Maurice Samuels has argued that the French embraced various forms of historical representation and transformed the past into spectacle in their collective efforts to grapple with the ramifications of the 1789 revolution.⁵² New popular entertainments emerged that involved varying degrees of simulation: the wax museum (with its arrangements of historical figures), phantasmagoria display (with images projected onto smoke), and the panorama (with enormous painted circular canvases depicting scenes from history) all employed new techniques to promote optical or embodied engagement for the growing masses. If these simulations offered an illusion of mastery over the past, the significant presence of geographical and cosmological themes in the panorama and related entertainments points to the public's greater desire for mastery over earth and sky.

The diorama and panorama played central roles in presenting geographical information to visitors in a convincing way. Photographer Louis-Jacques Mandé Daguerre developed the first diorama, opening it to the Parisian public on July 11, 1822.⁵³ Like the panorama, the diorama employed large-scale paintings; yet it distinguished itself in the subtle range of lighting effects that could transform a visitor's experience. Daguerre offered his first visitors a convincing simulation of a distant reality by proposing to transport them to the Valley of Sarnen (Switzerland) and the interior of Trinity Chapel at Canterbury Cathedral (Britain). The results were immediately successful, well received by critics and audiences alike. Within a decade, however, a tide of rising expectations had lifted viewer's expectations of verisimilitude to new heights. Daguerre met this challenge multiply, incorporating into his diorama elements to engage all of a visitor's senses.

From November 17, 1831, until December 1, 1833, Daguerre's diorama presented the *Vue de Mont Blanc prise de la vallée de Chamouny [sic]: Effet du mois d'avril*. To complete its illusion, Daguerre "imported a complete chalet with barn and outhouses and put on the stage a live goat eating hay in a shed, and in an attempt to counter the frequently made criticism of the unnatural quietness of the scene the performance was accompanied by the sound of an Alp-horn and songs."⁵⁴ A German visitor in 1832 described the scene in detail, including its effect on an English girl who cried out with joy, "That is not painting—its magic does not go as far as that! Here is an extraordinary mixture of art and nature, producing the most astonishing

effect, so that one cannot decide where nature ceases and art begins.”⁵⁵ An accumulation of details increased the verisimilitude, engaging every sense except perhaps taste.

Visual and embodied entertainments abounded in the nineteenth century, to a degree that continues to be rediscovered by scholars today. First in Paris (then in London and New York), the “Cosmorama” invited viewers on virtual tours of the world. Diversifying their approaches to gain a greater share of the audiences for such entertainments, some offered increased educational content while others encouraged new techniques and technologies, including varieties of “moving panoramas” to produce or simulate movement.⁵⁶ Geographically inspired entertainments became increasingly specialized, whether magic lantern shows to re-create the “Grand Tour” or immersive environments like the “Maréorama.” Created by the successful commercial artist and illustrator Hugo d’Alesi (1849–1906) for the 1900 Paris World’s Fair, the Maréorama offered a multisensory spectacle replete with effects meant to evoke the rolling deck of a boat at sea.⁵⁷

The Géorama stands out among these geographically inspired entertainments for its ability to physically project its visitors into a cartographic realm. In each of its incarnations, visitors entered the concave interior of the globe to experience it in an inverted fashion, as if the Earth wrapped around them. The first such Géorama (boulevard des Capucines, Paris; opened 1826) was initially projected to be forty meters in diameter, according to the *brevet d’invention*, paperwork provided to register plans and intellectual property related to this work, filed by its creator, Charles-François-Paul Delanglard (ca. 1768–1832). Although it was not built on such a grand scale, the finished globe was large enough that one could recognize distinct landforms on the relief maps that revealed all the continents. Geographer Jean-Marc Besse has documented the legacy of the original Géorama, through its four successors in Paris and the “Great Globe” built by mapmaker James Wyld in Leicester Square, London, to draw visitors attending the Crystal Palace exhibition of 1851. Its attempts to educate and entertain audiences, Besse suggests, likely inspired the geographer Reclus in his visionary scheme to erect a monumental globe for the Paris World’s Fair of 1900.⁵⁸

Reclus, a radical anarchist, promoted a vision of a purpose-built globe to be created on a large scale. Like the Géorama, it would accommodate audiences within the sphere, forming an inside-out globe. Relief maps of the continents and islands on the interior walls of the globe would give visitors a true sense of the proportions of the earth each nation occupied.

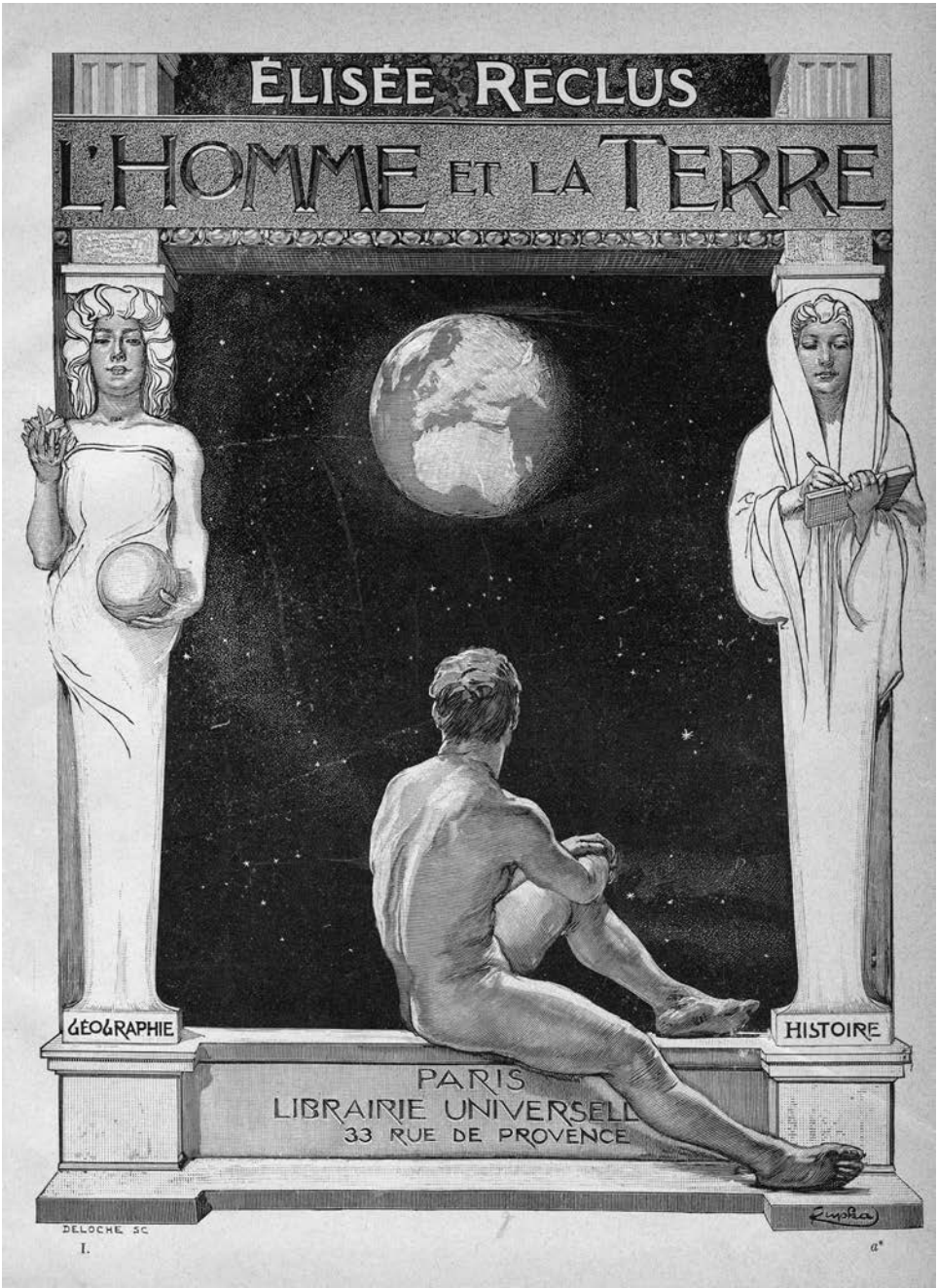


1.8. Galeron's "Grand globe céleste" (Great celestial globe), or "Cosmorama," installed beside the Eiffel Tower at the Exposition universelle, Paris, 1900. Single photograph extracted from a stereo view. Collection of the author.

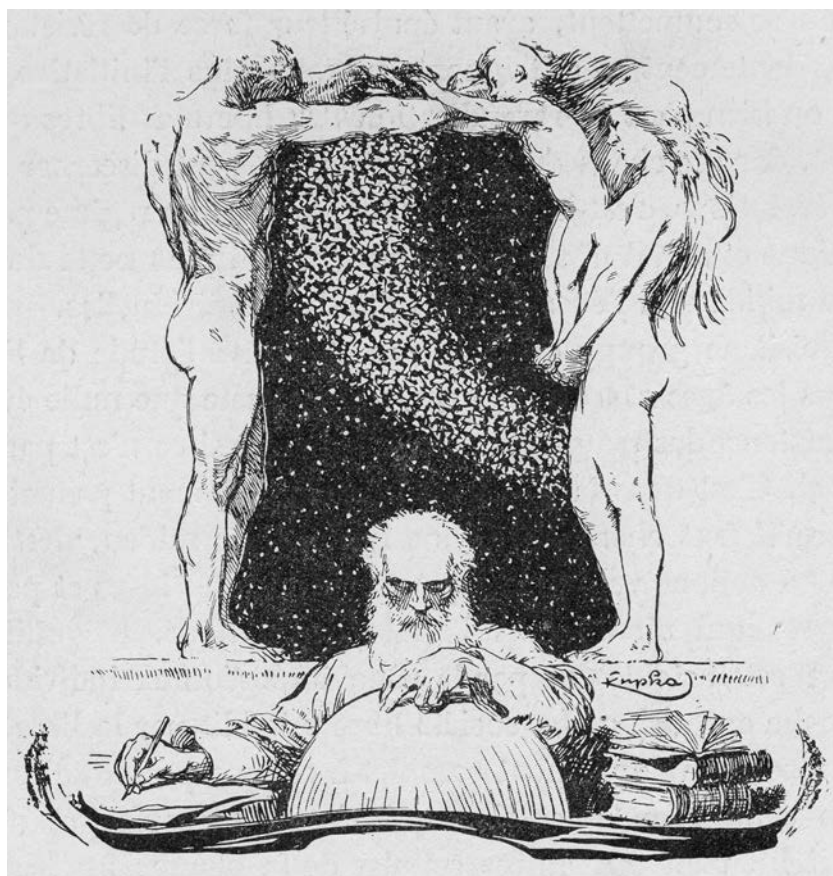
Through accurately sculpted relief they would communicate the immensity of the Himalayas and the relative smallness of the Alps. Reclus argued that a three-dimensional sphere, built in curved space, would offer more truthful representations than flat charts and maps provide. In sum, through embodied experience, visitors to the Reclus globe would achieve a new vision of the interrelatedness of all civilizations worldwide. Key to Reclus's radical plan was that the globe should be erected on an enormous scale, the better to communicate directly to the bodies within. After years of negotiation, over which time the chosen scale was successively diminished and the relief mapping threatened, Reclus eventually abandoned the plan. Before he did, he left a trail of pamphlets, talks, and publications touting the new global vision such an attraction would bring. The globe that Reclus had hoped to present at the Paris World's Fair of 1900 did not come to fruition. However, a surrogate variation at a vastly reduced scale (a globe of twenty-six meters) was created under the direction of Louis Bonnier (1856–1946), who served as the architect overseeing general planning and construction of the fair for the 1900 exhibit. Bonnier worked with architect

Paul Louis Albert Galeron (1847–1930) and engineer/entrepreneur Edmond Coignet (1856–1915) to realize the globe. Ultimately they combined Reclus’s plan for a terrestrial globe and Galeron’s project for a celestial globe into a single structure (figure 1.8). Melding an external celestial globe with a terrestrial globe inside, it welcomed audiences to experience the earth from a new perspective from its site at the edge of the Seine. It may not have provided the radical perspective promised by Reclus, but the “Cosmorama” or “Grand Globe Céleste de Galeron” proved to be satisfying entertainment nevertheless.

Duchamp could have learned about the Reclus globe through František Kupka, the Czechoslovakian-born artist whose cottage shared garden space with Duchamp’s brothers in Puteaux.⁵⁹ Where the structure’s utopian qualities would have appealed to Kupka, Duchamp would more likely have been interested in the playful experience of learning via a passage through an inside-out globe. Kupka had long studied the geographical and anarchist writings of Reclus; early in the twentieth century he embarked upon a commission to illustrate Reclus’s mammoth undertaking, a multivolume geography titled *L’homme et la terre* (1905; figure 1.9). Writing in the tradition of “universal geography,” as did Humboldt and others before him, Reclus dedicated individual volumes to different geographical regions; together, the collected volumes described the geography of the entire Earth.⁶⁰ Reclus’s work combined two approaches that have since further distinguished themselves through the rubrics of physical and cultural or human geography. While deeply attentive to landforms and their long history across eons of geographic time, Reclus paid significant attention to the development of human civilizations that populate the Earth’s surface. These he analyzed in relation to the geographical regions and environments each civilization occupied. For Reclus the categories of man and nature were intertwined: “l’homme est la nature prenant conscience d’elle-même” (Humankind is nature achieving self-consciousness), Reclus summarized in one pithy sentence.⁶¹ Kupka singled out the phrase as the representative credo encapsulating Reclus’s philosophy and used it as the basis of an illustration he placed at the preface to the book’s first volume. A pair of human hands cradles an earthly globe held aloft against the hand-lettering of Reclus’s sentence. To achieve self-awareness, humanity needed to study itself as nature and as a force effecting change in the natural world. Reclus’s globe would have situated humanity on Earth, the better to understand our place in the cosmos.



1.9. František Kupka, frontispiece for Elisée Reclus, *L'homme et la terre*, 1905.
© 2015 Artists Rights Society (ARS), New York / ADAGP, Paris.



1.10. František Kupka, illustration for Elisée Reclus, *L'homme et la terre*, 1905.
© 2015 Artists Rights Society (ARS), New York / ADAGP, Paris.

In Kupka's illustrations for Reclus, the self-awareness of humanity as "nature achieving self-consciousness" especially manifested itself in those scenes in which humans contemplate the immensity of the cosmos.⁶² Imagery of the Milky Way recurs in Kupka's illustrations to Reclus's text (figure 1.10). Against this backdrop Kupka contextualized the limited significance of human activity and the immensity of the universe. Despite the relative insignificance of the individual facing the infinite cosmos, the scholar shown in figure 1.10 turns to his globe and books to investigate the nature of the Earth. In this image, and in Kupka's related illustrations for Reclus featuring the Milky Way, a nuclear family (man, woman, and child) stand unashamedly naked before the starry night sky. Although they stand still in

this illustration, their stillness is an ease of rest unlike that of the caryatid figures in figure 1.9. Reclus's words and Kupka's images demonstrated the ways that humans forged ahead in the creation of civilization by investing meaning in relationships, urban development, seasonal labors, and creative activities. Kupka conjoined these sentiments in a striking image that was used as a frontispiece for *L'homme et la terre* and was reproduced in color as an advertisement for subscriptions to the multivolume geography (figure 1.9). In that image, a naked male figure (likely a self-portrait) sits on the edge of a classically inspired temple, gazing at the Milky Way, moon, and stars. The illustration was dear enough to Kupka that he kept a copy of the poster in his studio, where he was photographed standing against it around the time that he and Duchamp became friendly. In Kupka's hands, Reclus's writings were propelled by an iconography of earth and sky.

In 1911 and 1912, especially, Duchamp likely spent time in Kupka's studio.⁶³ Kupka's garden, residence, and studio adjoined those of his brothers in Puteaux, on the outskirts of Paris. The brothers Duchamp hosted fellow artists for weekly gatherings and lively conversations about the future of art; eventually, the group became known as the Puteaux Cubists in reference to the community where they gathered. Kupka, who was about five years older than Duchamp's elder brother Jacques Villon, offered perspectives on art and life that diverged from those of the Puteaux Cubists. Kupka's interests in contemporary culture were tempered by a deep spirituality that manifested itself in varied ways, not least of which was the emergence of a nonobjective art before "abstract painting" became known. Sometimes self-employed as a mystic, later as an art teacher, his political views tended toward the radical, including his fascination with Reclus. Kupka was deeply interested in contemporary scientific developments and followed them closely, as art historian John Hatch has shown.⁶⁴ During the same period when Duchamp investigated ways to represent movement in painting—resulting in works such as *Nude Descending a Staircase (No. 2)* (1912; figure 1.5)—Kupka worked to explore motion relentlessly and completed a large body of sketches and paintings related to these explorations. Through studies of his wife in movement or his stepdaughter tossing a ball, he created a distilled language of form that led to the birth of nonobjective or abstract art. A shared interest in motion might even have led Duchamp and Kupka to the Musée des arts et métiers, where scientific photography, including motion studies, was collected and displayed.⁶⁵

Founded in 1784, the Musée des arts et métiers predated the establish-



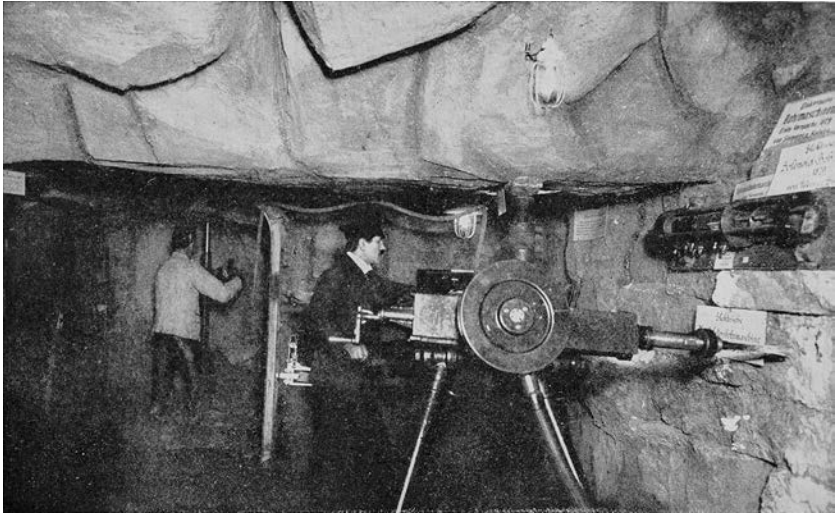
1.11. Unidentified photographer, postcard of the Conservatoire national des arts et métiers showing the exhibition of early airplanes, machines, and models relating to Bartholdi's *Liberty* in the museum's deconsecrated chapel, after 1920. Collection of the author.

ment of the Louvre Museum.⁶⁶ Originally founded as a place where inventions could be given to the French people as the basis of technical education, it became a point of registry for the first French form of intellectual property, through formal deposits of brevets, certified paperwork often accompanied by models. Drawing, geometry, and other skills for industrial success were taught alongside the earth sciences and physical sciences at the Conservatoire national des arts et métiers. Housed in a former abbey, the laboratories and classrooms appeared relatively modern (including a purpose-built amphitheater for scientific lectures). Yet alongside these spaces, the abbey's former refectory was turned into a library, and the deconsecrated chapel became the centerpoint of museum displays (figure 1.11). Initially a gallery of machines, by the early twentieth century the chapel exhibited recently donated sculptures by Frédéric Auguste Bartholdi next to new airplanes, motorcars, and bicycles, as well as new and historic machines, agricultural implements, and brevet models. Beyond the excited jumble of the chapel, a greater sense of order reigned. Tools of measurement and observation, including those for measuring earth and sky, filled the museum. Sections

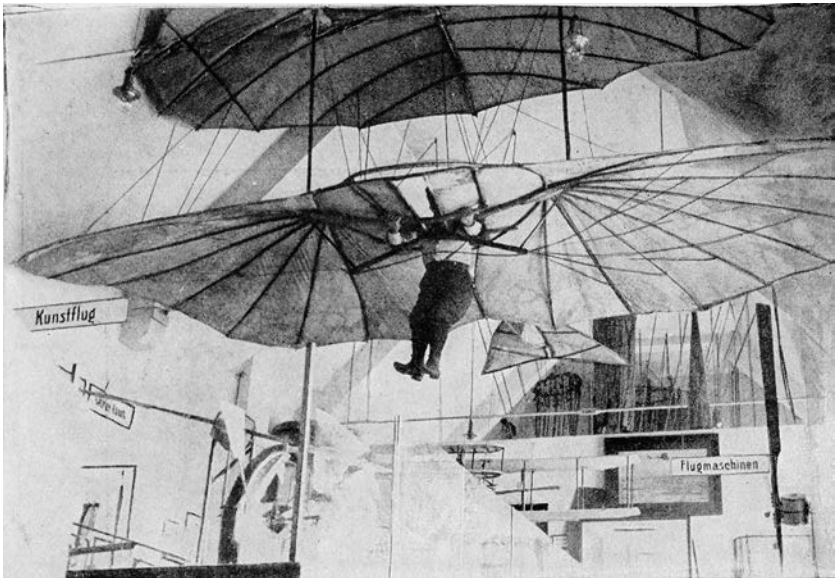
were dedicated to specific fields of scientific inquiry. Machines and other artifacts were often placed inside large glass vitrines that filled the massive halls and passageways. Historical artifacts from the history of science told a story of heroic progress. For instance, the museum reconstructed the laboratory of Antoine Lavoisier, “father of modern chemistry,” alongside ancient and modern historical documents and artifacts of science. Because objects were usually ensconced under vitrines, a sense of an enshrined past permeated the Arts et métiers, despite the dynamic educational programming to which these artifacts were subjected. In short, the mission of the Arts et métiers was to preserve a history of science while fostering new scientific discovery and dissemination of ideas.

The Deutsches Museum took these ideas into the dawning twentieth century. Founded in 1903 by the entrepreneur Oskar von Miller, the museum experienced a period of dynamic growth when Duchamp visited Munich in 1912.⁶⁷ Housed in barracks, warehouses, and other temporary quarters until 1925, the museum emphasized a dynamic arrangement of exhibitions and tactile access to many experiential learning tools. Like the Arts et métiers it also boasted a well-supported library, where Duchamp might have sought refuge amidst recent publications and ancient manuscripts.⁶⁸ Until the opening of the Palais de la découverte in 1937, the Deutsches Museum held the unofficial title of the most impressive science museum in the world. Emphasizing hands-on experiences in the exhibition spaces, it also presented historical materials innovatively. For instance, in a practice that was not yet common elsewhere, mannequins and live demonstrators were brought in to give a sense of bodily scale and implied interaction with the things and materials of science. Such was the case in the simulated mine built underground at the museum from its early years and later expanded when the new building opened in the 1920s (figure 1.12). A visit to the mine was instructive, all the more so since its exhibition design borrowed from wax museums and theater to create a space for immersive experience.

In the areas dedicated to aviation, bodies seemed to pilot the newly successful airplanes that hung from the ceiling (figure 1.13). Didactic signs hung in the air to guide viewers through an inherently sculptural ceiling display of a then recent history of new technologies. Key elements of Duchamp’s responses to his time in Munich were his shift away from traditional painting toward forms more “dry” and mechanical. In her analysis of a 1912 drawing Duchamp completed in Munich, titled *Airplane* (now in the Menil Collection, Houston), Linda Henderson notes that he created “a



1.12. Photograph of the interior of the Deutsches Museum, Munich, showing simulated mine. *Century Magazine* 84 (October 1912): 937. Courtesy of collections of the University of California Library, Davis.



1.13. Unidentified photographer, photograph of the interior of the Deutsches Museum, Munich, showing aviation section. *Century Magazine* 84 (October 1912): 940. Courtesy of collections of the University of California Library, Davis.

free-form variation on the theme of the skeletal frames and fabric coverings of early airplane construction,” while evoking “diagrams of the aerodynamics of flight.”⁶⁹ Upon his return to Paris in the fall of 1912, Duchamp renewed his engagement with aviation. From the time in Munich on, Duchamp “invented new objects that were a collage of multiple functions,” an approach that distinguished him from his cohort of fellow artists.⁷⁰ Such was the case with his new works made after his return to Paris, when aviation continued to interest Duchamp, his brothers, and their friends.

It seems fitting that the Parisian Duchamp would have found new inspiration from the displays of science and technology he found in Munich. Von Miller, the museum’s founder and an early innovator in electrotechnology, had been inspired by the exhibition of electricity in Paris (1882) to organize his own related spectacle at home in Germany. Transmitting electrical current a distance of some 175 kilometers to Frankfurt from Lauffen (where it had been generated), he demonstrated the potential to transmit electrical current over tremendous distances. Thanks to this long-distance electricity, he powered electrical attractions at the fair, including a manmade waterfall. The humor behind this spectacle of human-generated “natural” force would not have been lost on Duchamp, whose *Large Glass* (1915–23; figure 1.2) included references to water power and electricity.

Geography, astronomy, and aviation were well represented in the collections and teaching at the Deutsches Museum and the Arts et métiers. In 1912, von Miller embarked upon a project to bring a new planetarium to the Munich museum, building a prototype of what would become the Zeiss projection planetarium. The Deutsches Museum’s collaboration in bringing planetariums into being would be a significant marker for the history of modern science museums. Long before that it had made its mark through the new forms of audience engagement its exhibits offered. Like the popular entertainments and playful physics of the past, the new museums of science would stake their claim to blending education with entertainment, and science with spectacle.

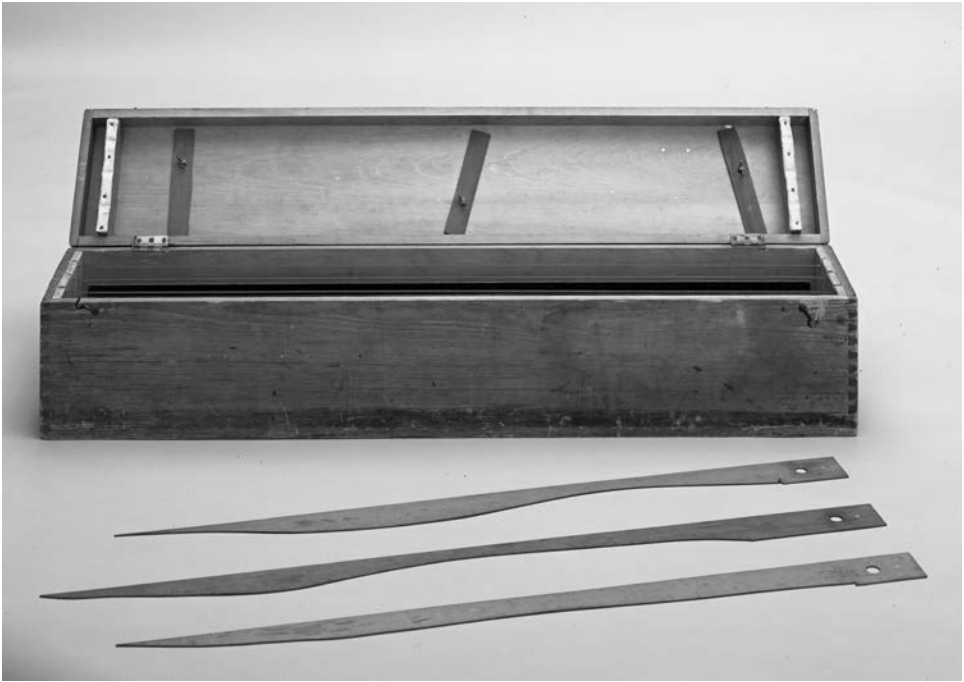
CHAPTER TWO

LANDSCAPES OF CHANCE

Cosmic Metaphors and Literary Stars

• literary figures loom large among the few sources and inspirations Marcel
• Duchamp identified in interviews and writings. Duchamp indi-
• cated the importance of Stéphane Mallarmé, Alfred Jarry, Guil-
• laume Apollinaire, and Raymond Roussel for their influence on
• • • • his art and thought. These predecessors engaged celestial themes
in ways that helped them to envision a new sort of literature. Their innova-
tions pointed to creative ways of thinking about the cosmos, while inflect-
ing the form and content of their writings. Apollinaire and Jarry extended
Mallarmé's idea of the constellation as a constitutive element of their liter-
ary innovations, encompassing their poetic transformations of typography
and of books conceived as objects. Mallarmé's constellations and poetics
intrigued Duchamp's friend and mentor František Kupka during the pe-
riod the older artist was illustrating the geographical writings of Elisée Re-
clus. Mallarmé's example inspired Duchamp's experimental aesthetics of
chance, leading him to create the artwork he credited with liberating his
creative practices, *Three Standard Stoppages* (1913–14; figure 2.1, plate 6).

As critics and historians defined modern art in the late nineteenth and
into the early twentieth century, they did so with emphasis on subject
matter, style, and technique. Landscape held particular value as a mod-
ern subject. Authors such as art historian Richard Muther pointed to those
landscapes depicted by Impressionist and post-Impressionist painters as
ideal subjects for modern art. Expanding upon Emile Zola's definition of
art as "nature seen through a temperament," Muther analyzed the rise of
nineteenth-century art through the lens of landscape painting. Such an
approach balanced fidelity to nature—the transcription of physical land-
scapes—with the expressionism of an individual artist's unique approach
or distinct "hand." "The principle of freedom has won the victory over for-



2.1. Marcel Duchamp, *Three Standard Stoppages*, Paris, 1913–14. Wood box $11\frac{1}{8} \times 50\frac{7}{8} \times 9$ in. (28.2 x 129.2 x 22.7 cm), with three threads $39\frac{3}{8}$ in. (100 cm), glued to three painted canvas strips $5\frac{1}{4} \times 47\frac{1}{4}$ in. (13.3 x 120 cm), each mounted on a glass panel $7\frac{1}{4} \times 49\frac{3}{8} \times \frac{1}{4}$ in. (18.4 x 125.4 x 0.6 cm), three wood slats $2\frac{1}{2} \times 43 \times \frac{1}{8}$ in. (6.2 x 109.2 x 0.2 cm), shaped along one edge to match the curves of the threads. Katherine S. Dreier Bequest, Museum of Modern Art, New York. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo: digital image © Museum of Modern Art / Licensed by SCALA / Art Resource, NY.

mula,” concluded Muther. “Everything is welcome on condition that an artistic temperament has brought it to expression.”¹ Muther signaled the conflict inherent in painting of the time, asserting, “The history of art betokens but a portion of the great work of the emancipation of the modern spirit. It betokens, like the history of the nineteenth century in general, the conflict of two principles—Tradition and Liberty.”²

Whether of earth or sky, landscapes dominated avant-garde painting in the late nineteenth and early twentieth centuries. A large scholarly literature has grown around the locales painted by the Impressionists and their followers, analyzing the social significance of the specific sites these artists depicted and their relevance for the burgeoning art market of the

epoch.³ Artists' fascination with new scientific ideas about the age of the Earth, the development of the physical landscape, and the fluctuations of meteorology directed new kinds of attention at evanescent experiences, like those of clouds, and led to new types of landscape paintings.⁴ Duchamp's contemporary Alfred Stieglitz, photographer and gallerist, could present photographs of clouds as the visual equivalents of music.⁵ Photography prompted reinterpretation of earth and sky by scientists, artists, and the lay public.⁶ Close observations of celestial phenomena communicated through drawings had, since Galileo, been the primary vehicle for scientific discussion of the nature and workings of the cosmos. At times, as with Lord Rosse's renderings of the view through his "Leviathan" telescope, the results could prompt revolutionary conversations about the nature of the cosmos.⁷ Popular scientific writings, such as those of Camille Flammarion, promoted the knowledge of the cosmos with similar observation-based imagery that attracted audiences as diverse as the author Roussel and the painter Vincent Van Gogh. Art historian Albert Boime argued that Van Gogh's painting *Starry Night* (1889) testified to the painter's fidelity to nature (depicting precise astronomical alignments) and simultaneously to a pantheistic set of spiritual beliefs connected to Flammarion.⁸ Rosse's depictions of a "Great Spiral Nebula" or "Whirlpool Galaxy" led to new theories about the plurality of worlds and a reconsideration of the nature of the cosmos. If the Milky Way were only one galaxy among many, this moved humankind further from the center of the universe (the place attributed to the Earth in pre-Copernican cosmologies). This astronomical understanding also ushered in the possibility that life existed on other planets, as Flammarion and others argued. The attention given to these changing concepts across the period from the late nineteenth through mid-twentieth centuries signals the importance (and instability) of public attitudes toward astronomy throughout Duchamp's life. Although references to astronomy recurred in his work, his treatments of the skies evidenced little interest in fidelity to the visual appearances of astronomical phenomena. Instead, the stars primarily inspired him in ways that were consistent with astronomy's multivalent power for authors such as Mallarmé, Roussel, and Jarry.

By contrast, Duchamp's engagement with geography began as an engagement with ground truth, as geographers call it, or at least with the visible reality of physical landscapes.⁹ As an aspiring young painter, Duchamp engaged the tradition of Impressionist painting through some of his early landscapes (figure 2.2). *Church at Blainville* (1902) adopted the freely scum-



2.2. Marcel Duchamp, *Church at Blainville*, 1902. Oil on canvas, $24\frac{1}{8} \times 16\frac{7}{8}$ in. (61.3 x 42.9 cm). The Louise and Walter Arensberg Collection, 1950, Philadelphia Museum of Art. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: Philadelphia Museum of Art / Art Resource, NY.

bled brushstrokes of Impressionism to lend qualities of dappled light in this portrayal of the village where Duchamp's family lived. Photo albums preserved in the family archive attest to Duchamp's attempted fidelity to nature in depicting a recognizable location.¹⁰ In these early paintings, young Duchamp worked, as did the Impressionists before him, to transcribe nature. Although the works that follow this "transcriptional" approach emphasize the artist's fidelity to the visual experience of specific sites, Duchamp rapidly and distinctly departed from transcription. Recent scholarship has returned to the potential significance of "ground truth" in analyses of his final work, *Etant donnés*, by linking it to a specific location outside Lake Geneva.¹¹

Looking beyond Duchamp's earliest and final works, the scope of his career-long engagement with landscape shows an eagerness to pursue alternative modes of representation beyond the level of transcription. In planning *The Large Glass* (figure 1.2), he distinguished between a terrestrial zone of the Bachelors below and an upper, celestial zone of the Bride. Duchamp's

notes defined the region of the Bride as including a “top inscription” that he likened to a “kind of Milky Way,” using the French phrase *voie lactée*.¹² In another note among those collected in the *White Box*, Duchamp employed distinctly geographical references to *paysagisme*, a term that scholars have generally translated as “landscapism.” Duchamp wrote,

A geographic “landscapism”—“in the manner” of geographic maps—but

The landscapist from the height of an aeroplane—Then the field trip (400 km). Notes taken i.e. for example number of houses in each village, or then again number of Louis XV chairs in each house—The geographic landscape (with perspective, or without perspective, seen from above like maps) could record all kinds of things, have a caption, take on a statistical look.—

There is also a “geological landscapism”: Different formations, different colors—A mine of information!

Meteorological landscapism (Barometry, thermometry, etc.)¹³

This note’s reference to a field trip of four hundred kilometers may link these thoughts with Duchamp’s “Jura-Paris road” journey of October 1912 in which he accompanied his friends Apollinaire, Gabrielle Buffet, and Francis Picabia on an automotive journey of that distance.¹⁴ Duchamp’s use of the ungainly term “landscapism” (*paysagisme*) merits further consideration. What forms of landscape representation do these notes envision, and what contexts for understanding “landscapism” existed around 1914?

In these notes Duchamp proposed a layering of the visual display of quantitative information, combined with an aerial view of the landscape. He chose data sets akin to those selected by the nascent academic fields of geography and sociology to gather information about a population; those he proposed—a census of residential structures or a survey of the furnishings within each building—could have been taken from the survey data compiled by the pioneering French social scientist Frédéric Le Play (1806–82) or his followers.¹⁵ Whereas an Impressionist’s representation of place was revealed through elements that were almost entirely visual, Duchamp here considered an array of scientific and nonvisual ways to assess physical and cultural geographies.

Duchamp may have devised the term “landscapism” himself, playing with words as he would do throughout his career. Equally likely, he might have selected this as an existing term in conscious recognition of its relatively uncommon character. “Landscapism” melds modern artists’ interest

in the subject of landscape to modern critics' compulsive labeling of label artistic movements or "isms." The critic Théophile Thoré, writing under the pseudonym Willem Bürger, coined the term *paysagisme* in his evaluation of the art on display in London for the 1862 World's Fair.¹⁶ Thoré-Bürger caricatured the distinctly contrasting approaches to contemporary landscape painting as national characteristics. According to Thoré-Bürger, English landscapists were overly attentive to detail and hobbled by their faithfulness to the ground truth of the physical sites. By contrast, Düsseldorfers worked mechanistically in the studio to craft philosophical statements unmoored from the landscape sketches that launched their paintings. "The artist should not be an abstract entity, in the German manner, nor a simple camera lens, in the English manner. The Germans' fault is that they do not reveal enough human character. The true artist is an unbreakable composite of nature and humanity, at one and the same time a seer and a thinker," wrote Thoré-Bürger.¹⁷ He thus elevated the French landscapists above their competitors, proclaiming the French to be worthy heirs to the Dutch seventeenth-century landscape tradition. Like the Dutch before them, Thoré-Bürger's French contemporaries such as the Fontainebleau School painter Théodore Rousseau (1812-67) capably balanced their feeling for the landscape (their "sentiments") with the ability to represent the physical geography of the places they painted.

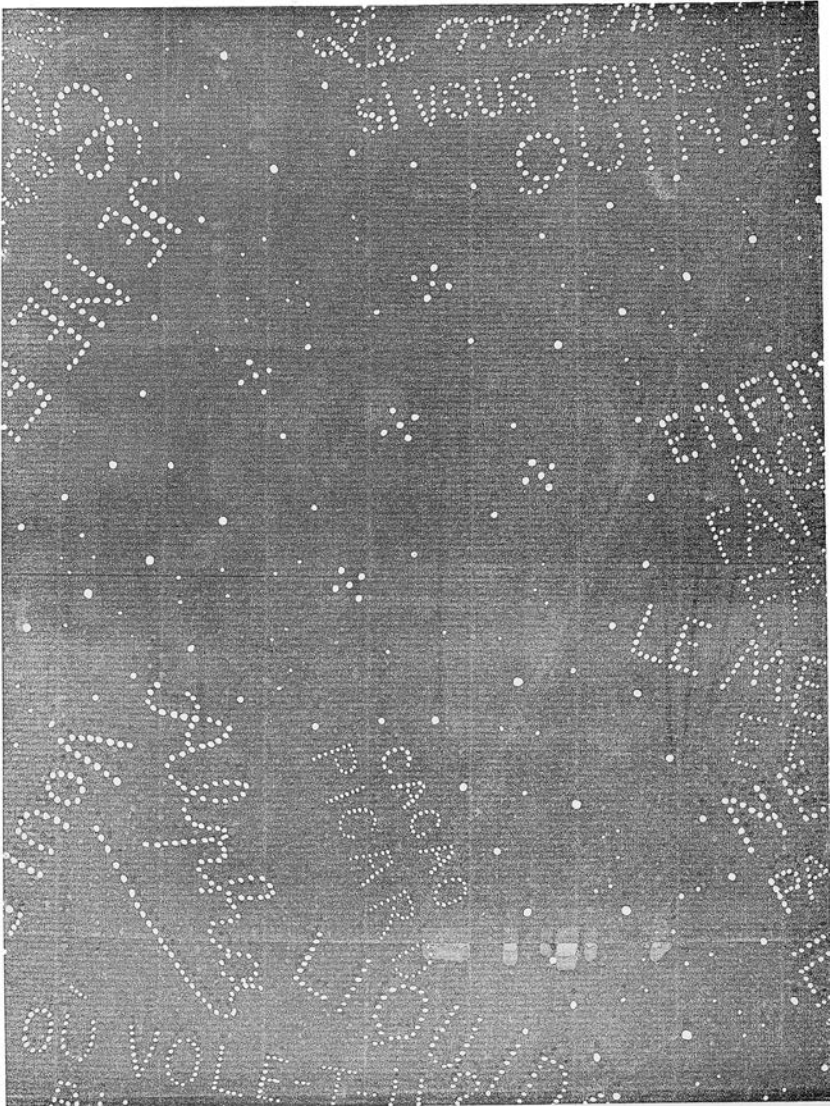
Neither expressionist nor literalist transcriptions of landscape characterize Duchamp's work. Despite his early dabbling with the expressionism of Fauvist-inspired painting, Duchamp showed little interest in expressionist paths to artistic creation. After his time in Munich during 1912, he moved toward a new art that he qualified as "dry." His embrace of an intellectual approach to creation became legendary, eventually inspiring the arena of conceptual art. "I wanted to put painting once again at the service of the mind," Duchamp recalled.¹⁸ Those guides along this intellectual path were authors, literary figures for whom the stars were distinctly inspirational. Jarry, Roussel, and Mallarmé emboldened Duchamp to create in newly intellectualized ways, to imagine worlds whose internal logic need not be subordinate to that of an outside world, to embrace dark humor and a ludic realm of free play, and to draw upon chance.

Duchamp's first paying jobs were as an illustrator of single-panel comics for humorous magazines, and his earliest exhibition credit was for works displayed at the Palais de Glace in a show of such works.¹⁹ As the art historian Patricia Leighton has demonstrated convincingly, the tendency among

scholars to downplay the significance of these ephemeral publications has skewed historical understanding of modern art so that “there is much we do not understand about modernism.”²⁰ Long after these humorous magazines ceased publication, Duchamp maintained a playful approach like that of the comic artists. Irony, in particular, characterizes Duchamp’s career. In theories of laughter developed by late nineteenth-century authors including Charles Baudelaire and Henri Bergson, humor acted as a socially corrective force; in Duchamp’s early work, echoing the edgy social criticism found in the satirical journals to which he contributed, humor seems to have worked in this way.²¹

Duchamp would likely have appreciated the humorous science fiction with which the Parisian magazine *L’Assiette au Beurre* treated early aviation in its December 14, 1901, issue, titled “A nous l’espace” (Space is the place). Albert Guillaume’s full-color single-panel comics for that satirical journal imagined a future air space above the globe. The foibles of humanity grew exponentially as people took to the skies above. Guillaume depicted balloonists ensnarled in aerial traffic jams that rivaled those experienced by the horse-drawn omnibuses and new motorcars in the muddy streets below. One page of this issue of *L’Assiette au Beurre* reveals how deeply the modern corporation had already emerged as a force ripe for caricature by 1901 (figure 2.3, plate 7). In Guillaume’s comic panel, constellations in the night sky vied for visibility with advertisements. On Earth below, such advertisements would have employed the relatively new technologies of electric lighting to illuminate the night. In Guillaume’s humorous prediction, the recognizable script of logotypes and light bulb-driven messages became the new constellations of the twentieth century.

In 1934 Duchamp issued a limited edition of boxes fabricated by hand and covered with green felt, known as *The Green Box* (figure 2.4, plate 8). He worked the felted surface of the box to puncture dots that form a title by allowing light to pass through. Like Guillaume’s page of advertising lights from *L’Assiette au Beurre*, the forms of Duchamp’s *Box* play upon associations with constellations and electric signs. I do not suggest that Guillaume’s image inspired Duchamp. Rather, both looked to the world around them for inspiration and saw a commodity-driven culture in which miraculous products became the metaphorical “stars” of society. Duchamp’s design of *The Green Box* echoes the appearance of lighted advertisements from the early twentieth century, in which rows of brightly illuminated light bulbs combine to form a word or image. Equally, the design of *The Green*



2.3. Albert Guillaume, interior page from “A nous l’espace” (Space is the place) special issue, *L’Assiette au Beurre* 37 (December 14, 1901). 9½ x 12¼ in. (24.2 x 31 cm). Collection of the author. © 2015 Artists Rights Society (ARS), New York.



2.4. Marcel Duchamp, *La mariée mise à nu par ses célibataires, même* (*The Bride Stripped Bare by Her Bachelors, Even*)—*The Green Box* 1934 (mixed media). Private collection. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo © Boltin Picture Library / Bridgeman Images.

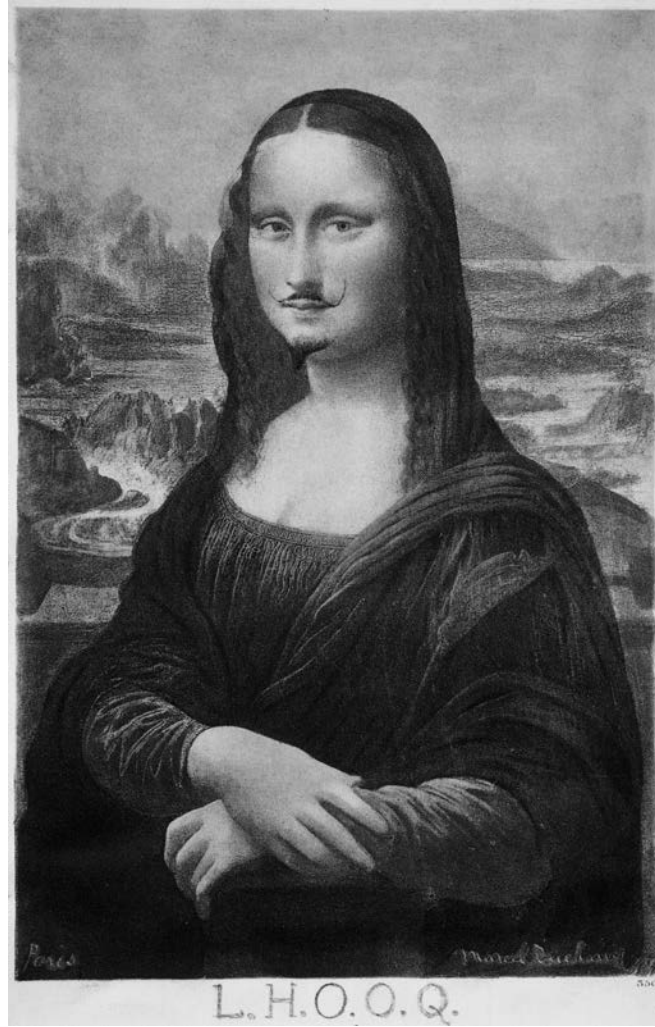
Box refers to movie-palace marquees declaiming the names of film stars. His *Box*, emblazoned with words referring to his greatest artwork before that time (LA MARIEE MISE A NU PAR SES CELIBATAIRES MEME) was an attempt to redirect his art into a new direction. Based on Mallarmé's idea of the book, its organizing principle was that of the facsimile.²² By the time of *The Green Box*, in 1934, Duchamp had successfully practiced various approaches to packaging his work so that it might occupy its own plane of existence and create a new space where art and literature might converge: *La boîte de 1914* (*The Box of 1914*). Each successive facsimile box created its own cosmos: *The Green Box* (1934); the edition *de ou par MARCEL DUCHAMP OU RROSE SELAVY* (1935+); the *Boîte-en-valise* (*Box in a Valise*; 1941+); and *The White Box, or à l'infinif* (*La boîte blanche*; 1966) each offered a distinct Duchampian universe to those who would explore the box's contents. To fabricate each of these boxes, Duchamp painstakingly reproduced collections of his paintings, sculptures, and handwritten notes using techniques of mechanical reproduction. As facsimiles, these reproductions garnered special status that associated them with creations of intellectual import, linked to Renaissance artist Leonardo da Vinci and the cultural resonance of his name.

Toward an Art of the Intellect: Artist, Scientist, and Maker of Notes

The modern perception of Leonardo da Vinci as both artist and scientist was promoted, especially, by facsimile editions of Leonardo's notebooks published between 1881 and 1893 under the supervision of Charles Ravaisson-Mollien, a curator of the Louvre Museum. New photographic technologies developed by Gustave Arosa facilitated the creation of exceptionally well-duplicated reproductions. These photomechanical reproduction technologies played a tremendous role in shaping popular and scholarly understandings of Leonardo at a time when the Renaissance held critical significance for contemporary critics and artists.²³ Leonardo, as he came to be known through the facsimile notebooks, engaged a wide range of activities—encompassing literature, science, engineering, design, and visual art—that offered a uniquely diverse model for modern artists. Few chose to follow in his footsteps as closely as Duchamp, though the latter did so with his tongue firmly planted in his cheek.²⁴

Duchamp engaged Leonardo's work on many levels. He did so directly,

2.5. Marcel Duchamp, *L.H.O.O.Q.*, 1919, reproduction made for the *Boîte-en-valise* (*Box in a Valise*), 1941. The Louise and Walter Arensberg Collection, 1950, Philadelphia Museum of Art. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: Philadelphia Museum of Art / Art Resource, NY.



in the readymade *L.H.O.O.Q.* (1919), a reproduction of the *Mona Lisa* embellished with moustache and beard (figure 2.5). Through the multiple sets of boxed notes he created throughout his career, with their echoes of the pages of Leonardo's notebooks, he engaged the Renaissance master more indirectly. To complete the requirement for compulsory French military service, Duchamp embarked upon a process of training and certification as an "art worker," whose skills would be useful to the nation in times of war. One of the steps he was required to complete included passing an

oral examination about an artist from history; his subject was Leonardo. There was plentiful material for him to consult. During the period from the mid-nineteenth to the early twentieth century, by some counts, more books were dedicated to the study of Leonardo than to any other cultural or historical figure. From these books emerged a new image of Leonardo as an ideal worthy of emulation by those modern artists who would seek to join art and science in their pursuits.

Duchamp's thinking about facsimiles as art, from his early encounters with Leonardo until his death in 1968, are indebted to the Ravaisson-Mollien volumes of Leonardo's notebooks. His artistic activities as producer of notes and facsimiles began in earnest before May 1913, converging with his studies at the Ecole des chartes and his work as a librarian at the Bibliothèque Sainte-Geneviève where he was employed beginning November 3, 1913.²⁵ At the Ecole des chartes the curriculum emphasized the study, preservation, and dissemination of archival documents. There, Duchamp studied the archive and pondered ways to make art something different: a "cosa mentale" in the words of Leonardo. Roussel showed the way.

Cosmic Imagination, Invented Worlds: Raymond Roussel

As an astronomer and popular author, Flammarion saw the universe as filled with wondrous beauty. He did more to promote popular astronomy than any other figure in late nineteenth-century France. In conjoined roles as editor of popular scientific publications, founder of the Société astronomique de France, director of an astronomical observatory (at Juvisy, outside Paris), novelist, and public intellectual, Flammarion was recognized internationally as a spokesman for contemporary science. Flammarion's impact should not be underestimated. His populist approach promoted amateur astronomy at a time when the science risked becoming overly specialized. His writings, translated into multiple languages, inspired countless individuals to look to the skies and seek meaning there. Author Roussel, whose importance Duchamp repeatedly signaled, was among those inspired by Flammarion. Roussel created a distinct sculptural object in homage to Flammarion.

A curious star-shaped object appeared at Sotheby's Paris auction house in 2007. Listed by the auction house as an "étoile cosmique," this "cosmic star" demonstrates the power of astronomy to capture the popular imagination in Duchamp's time and our own. Sotheby's multipart object appeared to be a star-shaped silver box with glass lid. An attached tag in the

handwriting of an acclaimed modern artist indicated that the box served as a sort of secular reliquary. Within this specially fabricated jewel case shaped like a five-pointed star nestled a small, star-shaped cake.

Although Sotheby's understandably likened this "cosmic star" to a ready-made by Duchamp, its greater relevance is in pointing to the convergence of art and science—in this instance focused on astronomy—that motivated the Surrealists to forge new paths to creation. Roussel and Flammarion offered Duchamp and his cohort exemplary models of creative thinkers who analyzed and transformed the celestial and terrestrial sciences through their art and science, respectively. Like Duchamp and the Surrealists, Roussel and Flammarion were inspired by the popular and scientific cultures of geography and astronomy.

A distinct provenance made the star-shaped case and its contents more significant than mere objects of curiosity. As the attached tag attested, Roussel had preserved the cake from a lunch at the home of astronomer Flammarion nearly eighty-four years earlier, on July 29, 1923. Following the death of Roussel, the star-shaped treasure had found its way into a flea market where, in the sort of find the Surrealists treasured, it was discovered by Surrealist author Georges Bataille. Bataille later immortalized the object as a key metaphor in his writings about Surrealist artist André Masson. Bataille gave the star as a gift to the Surrealist photographer Dora Maar, and the box was exhibited alongside Duchamp's readymades in the 1936 *Exhibition of Surrealist Objects* at the Galerie Charles Ratton, in Paris.²⁶

Duchamp encountered Roussel's work directly in the company of his friends, the artist Picabia, and the poet and art critic Apollinaire. Together they visited the Théâtre Antoine in Paris to experience one of the first performances of Roussel's *Impressions d'Afrique* (Impressions of Africa), sometime between May 11 and June 10, 1912.²⁷ Roussel financed most of his stage productions himself, as critics were quick to point out. *Impressions d'Afrique* was unlike anything previously presented on the French stage, although the fine line it walked between utter seriousness and total farce perhaps echoed the similar extremes of Jarry's theatrical productions. Had it not been as irrationally fantastical as it seemed upon its debut, *Impressions d'Afrique* might well have been compared to an entertaining funhouse and an educational panorama. Although supposedly set in Africa, *Impressions d'Afrique* erected its own fantastic geography, primarily developed out of puns whose improbable collisions generated surprisingly poetic meanings. Duchamp, ever intrigued by the generative powers of language (a character-

istic he shared with Apollinaire too), was, by all his later recollections, both inspired and transformed.

Writing on Christmas day 1949 from New York to French critic Jean Suquet, Duchamp emphasized his “debt” to Roussel:

One important point for you is to know how indebted I am to Raymond Roussel who, in 1912, delivered me from a whole “physioplasic” past which I had been trying to get out of. A production at the Antoine theater of *Impressions d’Afrique*, which I went to see with Apollinaire and Picabia in October or November 1912 (I would be grateful if you would check the date), was a revelation for the three of us, for it really was about a new man at that time. To this day, I consider Raymond Roussel all the more important for not having built up a following.²⁸

In this letter written almost fifty years after Duchamp saw the performance, he appears uncertain about the event’s timing, recalling that it occurred after his return from Munich. Autumn 1912 was especially significant for Duchamp. Had he seen the play in October or November (it was not performed then), it would have overlapped with the Salon d’automne and the major exhibition organized by “le groupe de Puteaux” known as the Salon de “La Section d’Or,” and the Exposition de la locomotion aérienne, or aviation salon.

Despite the confusion and the distance of this letter from the experience of witnessing the performance of *Impressions d’Afrique*, Duchamp asserted that Roussel “delivered” him from the physioplasic tradition in art. Written “physicoplasic,” the term might appear to be an artist’s neologism. By contrast, *physioplasic* art refers precisely to what Duchamp would call retinal art. Looking back from the vantage point of the late 1940s, Duchamp’s assessment of his artistic trajectory emphasized his shift toward a nonretinal art as the organizing principle of his earlier career. Natural historian Max Verworn (1863–1922) refined the concept of physioplasic art.²⁹ As a correspondent for the French journal *L’Anthropologie* summarized in a 1907 review, “Verworn distinguishes between physioplasic art, that represents objects naturally, as one sees them, and ideoplasic art, that represents them in a manner dictated by conventions, more or less stylized.”³⁰ Duchamp’s use of the term “physioplasic” points to the importance of his 1912 encounter with Roussel’s work at a convergent moment when he grappled with new ideas that confronted him during his “liberating” experience in Munich and the machines of science and technology celebrated by the Deutsches Museum.³¹

Imaginative machines played a key role in Roussel's text and its onstage performance. Roussel imagined machines that could make art or music, others that blended living with mechanical elements, and fear-inspiring apparatuses including a couch that harnessed the forces of nature (electrocuting the young woman, Djizmé, who is unfortunate enough to recline there during a lightning storm). Despite sparse performance documentation, it is clear that the presence of these complex machines onstage inspired Duchamp and his friends.³² Mechanomorphic forms that had surfaced in works like the *Coffee Mill* (1911) later merged progressively with the human figure, reaching their apogee in *The Large Glass* over the following decade.

From his classical education Duchamp's use of machine forms engaged the ideas of two Frenchmen, mathematician/philosopher René Descartes (1596-1650) and physician/philosopher Julien Offray de La Mettrie (1709-51). Their writings asserted that a divide separating mechanical from spiritual qualities was characteristic of the human condition. Duchamp's machines and Roussel's have been variously interpreted through the lens of La Mettrie's materialist philosophy in *L'homme machine* (Man, a machine; 1748) or the dualism of the Cartesian mind/body split. Redolent of Bergson's analysis of laughter, whose uncontrollable effects may be set off by an encounter with "something mechanical encrusted on the living," Duchamp's mechanomorphic works share these philosophically tinged qualities of humor with Roussel.³³ Roussel's machines are constructed from processes of wordplay. Through the production of improbable conjunctions in the conceptualization of these impossible machines, their realization propelled Roussel's narrative ever forward. Humor entered the Rousselian equation through his insistence upon the systematic application of a formal compositional technique that he referred to euphemistically as his "procedure." Duchamp and Roussel shared a fascination with wordplay, ranging from anagrams to puns, as a working method for generative creation. Roussel's methodical application of wordplay preceded the Surrealists' development of automatism and other techniques for prompting unconscious creation. Wordplay may have been one of many elements Roussel borrowed from Jules Verne, alongside elements of plot and narrative structure, in addition to their shared obsession with astronomy and geography.³⁴

In a fascinating study that sheds light on Roussel's uses of astronomy and geography, literary historians Terry Hale and Andrew Hugill have analyzed aspects of convergence and divergence in the writings of Roussel and Verne.³⁵ Parallels between the two authors' works reveal, for instance, that

Roussel adapted Verne's tale of shipwrecked travelers from *Les naufragés du "Jonathan" (Masterless Men)* as the point of departure for *Impressions d'Afrique*.³⁶ As Hale and Hugill note, in the writings of Verne and Roussel "both worlds are entirely imaginary. . . . The geographical details are precisely given in both cases, the difference being that Verne's accord with the known facts of real geography, whereas Roussel's are plainly impossible."³⁷ Verne's fiction perpetually asserted its verisimilitude through the accumulation of factual details about the physical world. Borrowing generously from encyclopedias, guidebooks, popular science publications, reference books, and the like, Verne's tales brim with details about natural history, geography, and astronomy. Indeed, Verne pioneered a new literary genre, of the "scientific novel" or *roman scientifique*, upon whose base later authors such as Jarry and Roussel built their own works. Roussel appeared uninterested in the scientific details that characterized Verne's writings, instead creating his own imaginative geographies. As contemporary audiences noted when *Impressions d'Afrique* premiered onstage, its "Africa" bore little or no connection to the continent of the same name.³⁸ Instead, it was an Africa of the imagination. Hale and Hugill interpret Roussel's work as one that is ultimately pataphysical, in the tradition of Jarry. Roussel's literary creations are looking-glass worlds, pataphysical creations to rival the unseen realities of the spatial fourth dimension that intrigued Duchamp. Roussel "affirms the supremacy of a truth discovered in fiction, and by fictional characters, over any truths isolated by 'science.' The plays-on-words in which these truths reside become doorways both to a superior and parallel world and to the properties of that world."³⁹

In this pataphysical sense, Roussel parallels Duchamp in playing with earth and sky as malleable raw materials, ripe for converting into the stuff of art. Astronomy offered raw materials for transformation in Roussel's *Nouvelles impressions d'Afrique (New Impressions of Africa; 1932)*. An astronomer appears among the limited cast of characters, in this tale told in verse form and organized in cantos. In the concluding canto he faces the celestial void or "vide céleste," to which the astronomer must accustom himself. Poet and critic John Ashbery suggested that "there is hidden in Roussel something so strong, so ominous, and so pregnant with the darkness of the 'infinite spaces' that frightened Pascal that one feels the need for some sort of protective equipment when one reads him."⁴⁰ To illustrate *Nouvelles impressions d'Afrique*, Roussel contacted artist-illustrator Henri-Achille Zo using the intermediary services of a detective agency. Maintaining his

anonymity, Roussel dictated strict parameters for each of the printed illustrations. Number fifty-nine, the final image, was prescribed to illustrate “a section of starry sky without any earthly landscape as if seen from some vantage point in space and giving the impression of infinity.” The resulting print echoes the photographic imagery of the night sky readily available in countless popular science publications.⁴¹

In *Nouvelles impressions d’Afrique*, parentheses within parentheses within parentheses obscure the structure of the cantos. Canto IV brings down to earth the stars of the sky above to alight on the head of a man whose identity may be that of the astronomer, or that of the author Roussel himself:

The sacred flame of genius
(((Which makes the one chosen by it so arrogant
That he finds the very stars in the sky pitiful
Compared with the new star that burns upon his forehead⁴²

The star on the forehead also appeared in Roussel’s work as the title of his play *L’Etoile au front* (1925). Roussel associated the starry forehead with himself, proclaiming it a mark of the genius, long after Duchamp had shaved his head with a star and tail to mark his own identity in 1921 (see chapter 4). Both may have been looking in homage to Apollinaire, whose collection of poems titled *Calligrammes* included a section titled “la tête étoilée,” or “the starry head.”

The Critic as Celebrant: Apollinaire’s Poetic Geographies

“Il est grand temps de rallumer les étoiles!” (It is high time we relit the stars!), proclaims the character of the Stage Manager in the prologue to Apollinaire’s play *Les mamelles de Tirésias* (The breasts of Tiresias, first performed June 24, 1917). The relighting of the stars comes after wartime artillery has snuffed them out (“Ils éteignent les étoiles à coups de canon”) and assassinated the constellations (“ils ont même assassiné les constellations”). Though written long before its 1917 premiere, Apollinaire’s comic play took on new meaning amidst the explosive artillery bursts of World War I that created fiery skylscapes to compete with the constellations. Apollinaire and Roussel preceded Duchamp as creators who shaped earth and sky as the raw materials of their creative activities. Between 1912 and Apollinaire’s September 1914 departure for Nice (to enroll in the army), Duchamp and the poet appear to have come to know each other relatively well, a level

of friendship sealed by an automobile trip in the company of Picabia and Gabrielle Buffet-Picabia during autumn 1912.

An iconography of stars permeates Apollinaire's poetry and drama. His prologue to *Tirésias* treats the stars with tenderness and wonder, even while manipulating them as if they were candle flames to be extinguished and then illuminated again. Stars appear and reappear in the word-picture poems he called *Calligrammes*. In one especially beautiful example, the poem titled with the name of his beloved "Madeleine," Apollinaire nestled a star inside a heart. An imagined conversation between the poet and his muse is carried by star and returned by terrestrial paths in an envelope, drawn on the page with both word and image.⁴³ Striking a different emotional register, Apollinaire retitled an existing poem as "Tristesse d'une étoile" (Sadness of a star) after an artillery shell penetrated his head during battle on March 17, 1916.⁴⁴ Given the poem's location in the midst of the section of *Calligrammes* titled "La Tête étoilée," many have associated the "starry head" with the poet's experience of being struck by the artillery shell, a human-made "étoile filant" (shooting star). Duchamp's starry haircut of late summer 1921 may have been shaven as a memorial to Apollinaire. Recognizing that Apollinaire's birth date was August 26 offers further support for the argument of Duchamp's *Tonsure* as a concrete realization of the "starry head" of Apollinaire.⁴⁵

Apollinaire filled his poetry with themes of landscape. From the verbal cityscapes that bring specific sites to life ("Zone") to the verbal-visual calisthenics of the calligrammes ("Paysage"), celestial and terrestrial landscapes fill his poetic works. Where Duchamp would later select readymade objects for his art, Apollinaire inserted lines overheard on the street into his poetry to give it the dialect of a specific time and place. Painting with letterforms in the calligrammes, he asserted his role as artist ("moi aussi, je suis peintre," he would write) while elsewhere he "painted" with the musical tones of words, as when he brought to life a bridge over the river Seine, in "Le Pont Mirabeau." An optimism and awareness of beauty fill Apollinaire's words.

Apollinaire likely joined Picabia and Duchamp in visits to the Musée des arts et métiers where they could scrutinize specimens of aeronautic technology, including celebrated early aircraft. Sharing an interest in art, aviation, and modern science, Duchamp and Apollinaire also shared an appreciation of Mallarmé and an engagement with that poet's revolutionary concepts about poetry and its "constellations." Mallarméan constellations appear in Apollinaire's poem "La Chanson du Mal-Aimé," that appeared in the

Mercur de France on May 1, 1909. Its title swells with wordplay: this poem is a love song, a song of one who is poorly loved, a song of mispronounced “Mallarmé.” Apollinaire speaks of the Milky Way as a “luminous sister” and closes the stanza swimming across galaxies toward other nebulae:

Voie lactée ô sœur lumineuse
Des blancs ruisseaux de Chanaan
Et des corps blancs des amoureuses
Nageurs morts suivrons-nous d’ahan
Ton cours vers d’autres nébuleuses

Milky Way, oh luminous sister
The white streams of Canaan
And the bleached bodies of lovers
Swimming shades follow us
Onward toward other nebulae.⁴⁶

Apollinaire chose not to title this a “tombeau” (the memorial form with which Mallarmé paid homage to E. A. Poe). Yet the musical language of Apollinaire’s poem achieves the level of homage through its interaction of cosmos, love, and wordplay, elements that characterize Mallarmé’s poetry and crystallized Duchamp’s interest in it.

Mallarmé: Poem, Book, Constellations, Cosmos

Speaking with James Johnson Sweeney of the Museum of Modern Art, Duchamp recalled, “My ideal library would have contained all Roussel’s writings . . . and Mallarmé. Mallarmé was a great figure. This is the direction in which art should turn: to an intellectual expression, rather than to an animal expression. I am sick of the expression ‘bête comme un peintre’ —stupid as a painter.”⁴⁷

Mallarmé drew upon the notion of the constellation most famously in the visual poetry of his influential *Un coup de dés jamais n’abolira le hasard* (A roll of the dice will n/ever abolish chance). The poet’s last published work, *Un coup de dés*, first appeared in 1897. Although its printing in 1897 did not convey the visual aspects of the poem’s distinct use of typography, it was enormously influential nevertheless. Poet Paul Claudel wrote of Mallarmé’s *Un coup de dés* with simultaneous reference to its typographic sophistication and cosmic signification, calling it “a great typographic and

cosmogonic poem.”⁴⁸ In the words of the poet Paul Valéry, that poem’s accomplishment was to “finally lift a page to the power of the starry sky.” Mallarmé’s fascination with the stars figured in his dramatically new approaches to transforming the verbal and visual forms of poetic language. Constellations of the night sky directed both the form and content of Mallarmé’s poem *Un coup de dés jamais n’abolira le hasard*.

For Mallarmé, the astronomical analogy provided by the constellations proved especially significant. As with the ancient naming of the constellations, an act of naming was an act of poetic creation for Mallarmé. Through verbal conjunctions he sought to produce new words and even to make ideas appear in the space between words (where no physical words existed). For Mallarmé, this creative activity paralleled the human designation of constellations amidst the dark spaces of the night sky. Ancient storytellers and artists delineated patterns from the inchoate forms they perceived in the night skies. Where stars aligned by chance, the ancients constructed pictures, stories, and meaning around their patterns. The *Nouvelle Revue Française* published a posthumous edition of 1914 that included the experimental layout and typography for which Mallarmé’s *Un coup de dés* has become known. When the 1914 edition appeared, it prompted a rediscovery of the poet and launched a renewed interest in Mallarmé’s convergence of the visual, verbal, and cerebral possibilities of poetry. Its typographical innovations transfixed readers, as did its content. In *Un coup de dés*, words form constellations of meaning and music in the reader’s mind, while assuming visual forms such as constellations on the printed page. Mallarmé reinforced the relationship with constellations on the final two-page spread of the poem. There, the words “A CONSTELLATION” appear prominently. Amidst this literal statement, other words gather across the pages to assume a form recalling the constellation known as the Big Dipper.⁴⁹ Depict “not the thing, but its effect,” Mallarmé wrote, in words that resonate with Duchamp’s later trajectory away from the “retinality” of painting and toward more immersive experiences.

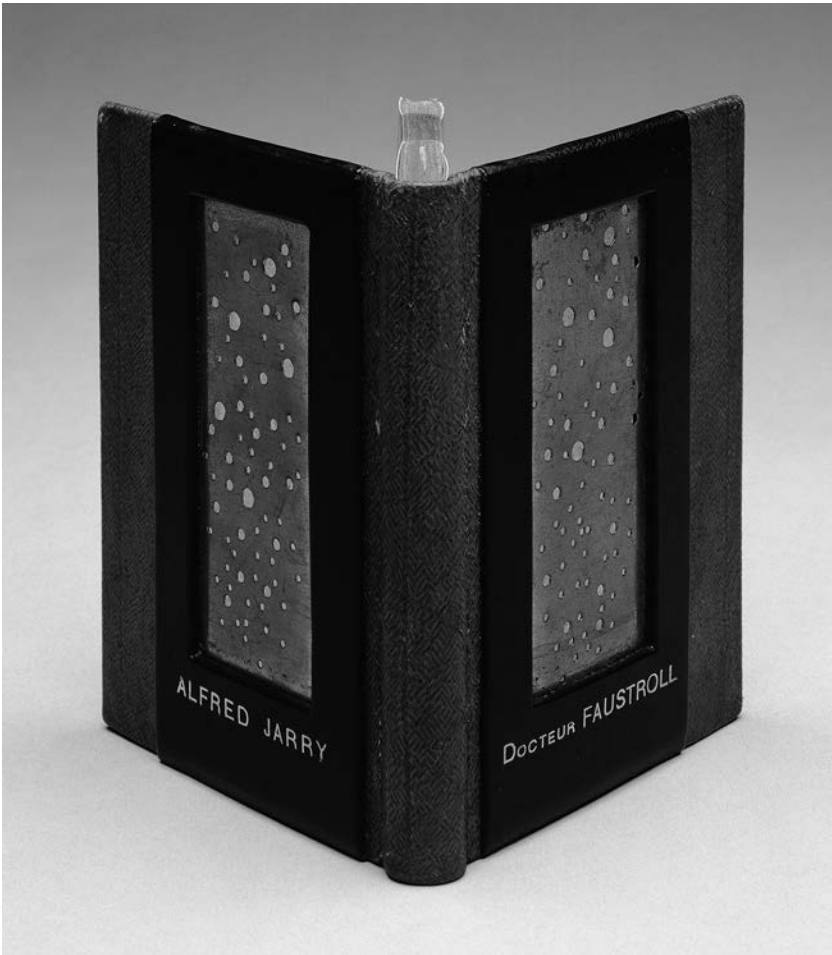
Metric Monuments, “Canned Chance,” and Jarry’s Pataphysics

Not long after Duchamp returned from summer travels to England in 1913, he began a work that deliberately questioned cultural differences such as the distinct systems of weights and measures used by the British and the French.⁵⁰ The resulting work deliberately experimented with the length of

the meter by subjecting it to chance operations.⁵¹ Duchamp acknowledged Mallarmé's significance for the work *Three Standard Stoppages* (1913-14; figure 2.1, plate 6). "It's a 'canned meter,' so to speak, canned chance; it's amusing to can chance," he told interviewer Pierre Cabanne.⁵² Duchamp linked its Mallarméan aspects to Jarry's pataphysics during a 1964 lecture at New York's Museum of Modern Art, explaining, "This experiment was made in 1913 to imprison and preserve forms obtained through chance, through my chance. At the same time, the unit of length[,] one meter[,] was changed from a straight line to a curved line without actually losing its identity [as] the meter, and yet casting a pataphysical doubt on the concept of a straight edge as being the shortest route from one point to another."⁵³

To create the *Stoppages*, Duchamp took a one-meter segment of waxed tailor's thread and dropped it from the height of one meter, onto a prepared canvas, so that its new shape would be preserved.⁵⁴ By repeating the process two more times, he added a pataphysical dimension, turning the repetition upon which experimental science depends against science itself. Jarry defined pataphysics as "the science of the particular, of laws governing exceptions."⁵⁵ Jarry's fullest pataphysical pronouncement came through a novel titled *The Exploits and Opinions of Doctor Faustroll, Pataphysician* (figure 2.6). In it, he paid homage to dozens of contemporary and historical scientists (alongside poets, such as Mallarmé), emulating their language or style. Just as pataphysics transformed physics into a playful science, Duchamp's investigation of the shortest route between two points is deliberately fanciful. With the *Stoppages*, Duchamp pataphysically questioned the positivist impulse to measure, a practice that English painter Sir Henry Marks had dealt with humorously in his painting *Science Is Measurement* (1879), in which an academic confronts his doppelgänger in the form of a skeletal specimen.⁵⁶ Measurement was essential to modern science. Through the practices of geodesy, mapping earth and sky, the distance between the North Pole and the equator was determined along the arc of the meridian. The *Stoppages* questioned the precision of a standard measure that "was supposed to verify the precise length of the meter, but was based upon a mistaken measurement of the globe itself."⁵⁷

From the beginning of the nineteenth century, copies of the standard meter were produced and displayed at the Conservatoire national des arts et métiers. Conferences held there and internationally reiterated the importance of the meter's standardization and the stability of the platinum version eventually housed at the Pavillon de Breteuil, in the Paris suburb of Sèvres.



2.6. Alfred Jarry, *Gestes et opinions du Docteur Faustroll, pataphysicien* (*The Exploits and Opinions of Doctor Faustroll, Pataphysician*), with unique binding by Mary Reynolds (Paris: Librairie Stock, 1923). Mary Reynolds Collection, Ryerson and Burnham Libraries, Art Institute of Chicago. Photo credit: Ryerson and Burnham Libraries, Art Institute of Chicago.

Duchamp scholars have long emphasized the significance of the standard meters enshrined in the Conservatoire national des arts et métiers, l'Observatoire de Paris, and the Pavillon de Breteuil for Duchamp's *Three Standard Stoppages*.⁵⁸ Indeed, the museum qualities of the meters preserved with care in these three locations resonate with the careful preparations and processes Duchamp employed in constructing the *Stoppages*.



2.7. Jean Chalgrin, *Monument métrique*, monumental meter in marble, 1796, a predecessor of the standard meter or *mètre étalon*. Photograph from Fernand Gerbaux, *Le mètre de marbre de la rue de Vaugirard* (Paris: Firmin-Didot, 1904), 1. Courtesy of collections of the University of California Library, Davis.

Duchamp visited the Conservatoire national des arts et métiers and lived in proximity to l'Observatoire de Paris and the rue de Vaugirard at the time he conceived the *Stoppages*. The standard meter was standard fare for newspapers in the time of Duchamp's youth and early adulthood, especially when the idea of the unwavering meter was periodically assailed. Even publications for families and children dealt with the standard meter and its "enshrinement," illustrating the Pavillon de Breteuil and encouraging youths to make their (distinctly secular) pilgrimage there. While he was taking classes at the Ecole des chartes and working as a librarian in the Bibliothèque Sainte-Geneviève, Duchamp likely encountered the surrogate meter on the Left Bank, one of the last remaining "metric monuments" placed across the city amidst the transformations that swept the nation after the revolution of 1789 (figure 2.7). Given the significance of the *Stoppages* for Duchamp's career, and the dialogue with monuments engaged by his readymades, it is surprising that the idea of the metric monument has yet to receive substantial consideration.

On March 26, 1791, the revolutionary Academy of Sciences (l'Académie des sciences) formally declared the length of the standard meter to be the ten-millionth part of a quarter of the terrestrial meridian. In 1796, in an effort to publicize the use of the metric system and to familiarize the population with it, the National Convention authorized the permanent public display of standard meters in sixteen of the most frequented places of Paris. These public displays were built of marble with metal inlay, following the

designs of architect Jean Chalgrin (1739–1811).⁵⁹ Best known as the designer of the Arc de Triomphe (1806–11), and earlier works in a neoclassical architectural style, Chalgrin began his architectural career as a recipient of the prestigious Prix de Rome. Upon his return to Paris he embarked upon a series of official appointments under the monarchy and, subsequently, the postrevolutionary governments. Since he was able to navigate the political labyrinths and tremendous upheavals of the revolutionary age, his earlier experience as inspector of public works for the city of Paris prepared him to succeed in orchestrating and carrying out a plan to erect “metric monuments” (*monuments métriques*) at selected locations in the streets of the capitol.⁶⁰ These monuments would educate the populace in the newly standardized measurement known as the meter.

Chalgrin selected sixteen locations where these metric monuments were to be placed, each heavily trafficked site characterized by public visibility and a distinct history. According to records kept in the Archives nationales, Chalgrin worked with the revolutionary government’s Agence temporaire des poids et mesures to prepare marble meters for public display in sixteen original sites:

1. Jardin des Tuileries (Tuileries gardens);
2. Luxembourg palace and gardens, on rue de Tournon (today, 36 rue de Vaugirard);
3. Palais de Justice;
4. entry of the Palais Egalité (the revolutionary name for the former Palais Royale or royal palace);
5. porte Antoine, one of the primary gates into the old city of Paris;
6. porte Martin, another of the gates;
7. porte Denis, another of the gates;
8. poste aux lettres (presumably the postal headquarters [Bureau de la poste aux lettres], rue des Déchargeurs);
9. place Maubert;
10. rue Denis near the rue aux Ours (presumably rue Saint-Denis, following the revolutionary tradition of deleting religious references from place-names, as in the names of the city gates listed in 5–7 above);
11. Jardin des Plantes (national botanical gardens);
12. Bibliothèque nationale (national library);
13. boulevard des Italiens;

14. Pont-Neuf, a bridge over the Seine in central Paris;
15. place de Grève (known, since 1802, as the Place de l'Hôtel de Ville);
and
16. entry to the Galerie des Tableaux" (presumably the Louvre, then known as the Museum Central des Arts).⁶¹

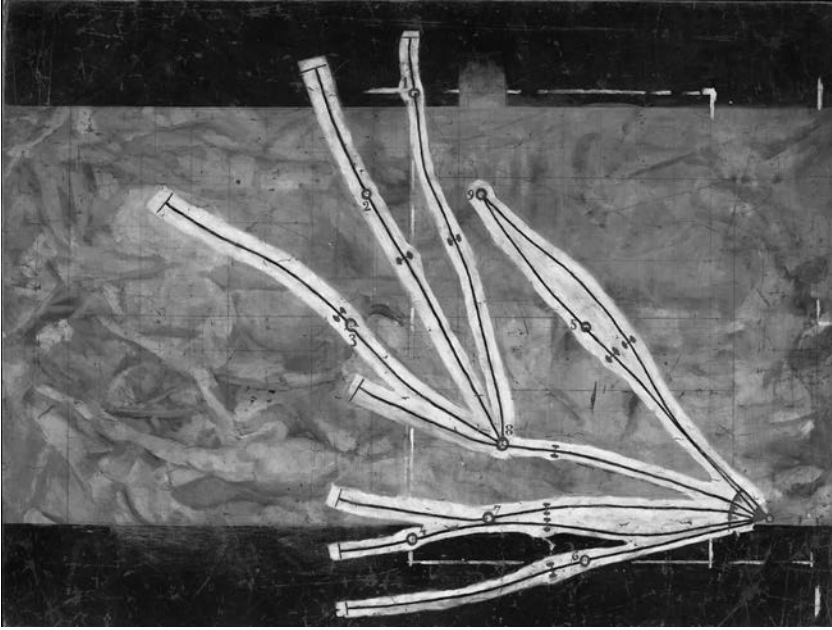
Although these locations may have been selected for their proximity to public market places, the primary feature unifying all of the sites is their significance as recognizably *public* spaces. According to archivist and historian Fernand Gerbaux (1857–1925), these metric monuments were installed between February 1796 and May 1799. Each was made using marble from the former collections of the French kings at Marly, inlaid with precisely worked copper measurement markers.

Today, only four of Chalgrin's standard meters are known to remain in public places, two inside and two outside Paris. Their locations are as follows:

1. 36 rue de Vaugirard, across from the French Sénat, Palais de Luxembourg;
2. 13 Place Vendôme, to the left of the entrance to the Ministry of Justice on the facade of the Hôtel de Bourvallais (in this location, the version from 1796 was replaced by another in 1848);
3. Croissy-sur-Seine (Yvelines), embedded in a wall at la rue au Mètre (again, a replica; the original is conserved in the town's Hôtel de Ville);
and
4. Sceaux (Hauts-de-Seine), in the lobby of the ancienne Mairie.

Little has been written of the history of the metric monuments beyond the archivally driven research published by Gerbaux between 1902 and 1904. Many learned of their presence through a direct and sometimes unanticipated encounter with the standard meter on the rue de Vaugirard. Its lingering presence on the streets of Paris owes much to Gerbaux, who promoted knowledge of its history and advocated for its preservation.⁶²

Having redefined the standard meter, Duchamp used his three variations or stoppages to create three wooden templates. These allowed him to incorporate the *Three Standard Stoppages* into a new work, *Network of Stoppages* (1914; figure 2.8). To make this work he began with an abandoned painting of a man and woman in a garden setting, turned it from its origi-



2.8. Marcel Duchamp, *Network of Stoppages*, Paris, 1914. Oil and pencil on canvas, 58 $\frac{5}{8}$ in. x 6 ft. 5 $\frac{5}{8}$ in. (148.9 x 197.7 cm). Abby Aldrich Rockefeller Fund and gift of Mrs. William Sisler, Museum of Modern Art, New York. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo: digital image © Museum of Modern Art / Licensed by SCALA / Art Resource, NY.

nal (vertical) orientation to a new (horizontal) orientation. Using pencil, he mapped a grid on the surface of the painting and enumerated each square within the grid. Tracing each template three times onto the abandoned painting, he incorporated the forms of the *Three Standard Stoppages* into the new work. The resulting system of cartographic patterns “resembles the diagrammatic relationship on a Thomas Cook map of certain European cities which Duchamp visited in 1912, taking Rouen as a starting point.”⁶³ Kieran Lyons has similarly speculated that the stoppage-traced diagrams map Duchamp’s journeys back and forth across Paris to deliver *Nude Descending a Staircase* to the salon and then transport it home again when his brothers suggested it be removed from candidacy for the exhibition.⁶⁴ The *Three Standard Stoppages* and the *Network of Stoppages* thus illustrate, on multiple levels, Duchamp’s increasingly playful engagement with geography and translation of his experience of travel into new techniques

for the conception and creation of modern works of art. His landscapes of chance departed from pictorial traditions in ways he elaborated further in his readymades and later exhibition design. Inspired by the cosmic engagements with chance in the works of Mallarmé, Jarry, and others, he created new landscapes of possibility in the “mind’s eye” of a viewer.

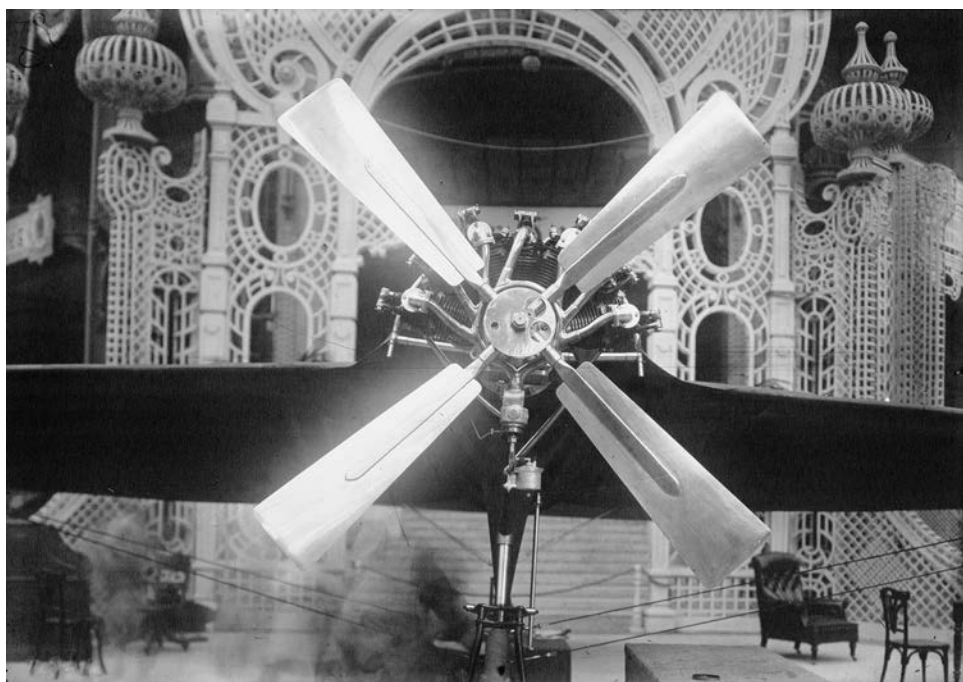
CHAPTER THREE

AVIATION AND SUBSTITUTION

Celestial and Terrestrial Geographies of the Readymades

“Painting is finished,” Marcel Duchamp declared to the artists Constantin Brancusi and Fernand Léger, when the trio visited the 1912 Exposition de la locomotion aérienne in Paris (figure 3.1). “Who can do better than that propeller?” When he spoke in this way Duchamp stood surrounded by vehicles designed to connect earth and sky. When Léger later recalled Duchamp’s statement uttered in the space of the Exposition de la locomotion aérienne, the words seemed to echo like a gauntlet thrown in challenge to his fellow artists.

In creations made soon after the Exposition de la locomotion aérienne, Duchamp engaged earth and sky in ways that were distant themselves from earlier traditions of landscape representation, beginning immediately with the *Bicycle Wheel* (figure 3.2) and subsequent readymades. Soon after, he began to craft *The Large Glass* (figure 1.2), embarking on a nearly decade-long process to make a work that engaged landscape traditions while evading categorization (was it painting? sculpture? neither, or more?). In this chapter, I suggest ways that the *Bicycle Wheel* may have been initially inspired by Duchamp’s experience at the 1912 Aviation Exposition, later taking on additional meanings in the changing contexts of his studio, exhibitions, facsimile reproductions, and his larger career. Seen in these ways, the readymades are emblematic of the multivalent character of his art, changing meaning in different circumstances.¹ Using theoretical tools developed by Duchamp’s fellow Surrealist/pataphysician Michel Leiris, I emphasize the role of substitution in Duchamp’s selection of the readymades. “We can ask ourselves,” wrote Leiris, “if, in our modern ways of feeling and thinking, a good part of what are conventionally understood as aesthetic sensations don’t have more to do with a game of substitutions.”² Through this lens, the diverse industrial identities of the readymades fall away so



3.1. Exposition de la locomotion aérienne, 1909, REP Engine (10-cylinder, 35 HP), designed by Robert Esnault-Pelterie. Press photograph, Agence Meurisse. Modern digital scan from a glass negative, $5\frac{1}{8} \times 7\frac{3}{32}$ in. (13 x 18 cm). Collections of the Bibliothèque nationale de France, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.

that these objects cohere when viewed as surrogates for the monuments of Paris. This interpretation does not contradict Duchamp's statements about his "disinterestedness" in the selection of the readymades. Associating the readymades with landscapes places them outside the aesthetic categories most often invoked by Duchamp's contemporaries, especially that of the Puteaux Cubists' insistence on aesthetics and notions of taste inspired by the philosopher Immanuel Kant. Given the significance of the readymades, arguably the most influential aspect of Duchamp's career, the contexts in which the readymades would have been initially visible in his studio merit further consideration.

Originally standing only $5\frac{1}{4}$ inches tall, the readymade sculpture of December 1919 titled *Air de Paris* (*50 cc of Paris Air*) holds a much greater significance than its dimensions might indicate (figure 3.3). By the time Duchamp



3.2. Marcel Duchamp, *Bicycle Wheel*, 1913/1951. New York, 1951 (third version, after lost original of 1913). Metal wheel mounted on painted wood stool, 51 x 25 x 16½ in. (129.5 x 63.5 x 41.9 cm). The Sidney and Harriet Janis Collection, Museum of Modern Art, New York. Photo: digital image © Museum of Modern Art / licensed by SCALA / Art Resource, NY. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: Philadelphia Museum of Art.

3.3. Marcel Duchamp,
Air de Paris (50 cc of Paris Air),
1919/1949. Glass ampoule
(broken and later restored),
height 6 in. (15.2 cm). The
Louise and Walter Arensberg
Collection, Philadelphia
Museum of Art. Art Resource,
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Marcel Duchamp.
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Museum of Art.



christened this object, his thinking about the readymades had crystallized. Selected as a gift for his patrons, Walter and Louise Arensberg, the glass sculpture began its life as an ampoule of physiological serum Duchamp purchased from a Paris pharmacy. Duchamp asked the pharmacist to empty and then reseal the ampoule, trapping air from Paris in such a way that it would be preserved and transported back to the Arensbergs in the United States. The resulting work is a *souvenir* in the original French sense of the word, indicating something that brings back memories. Its title resonates with music, while the object retains trace memories of its salty past.³ As a souvenir “containing” Paris, *Air de Paris (50 cc of Paris Air)* points to the possible interpretation of Duchamp’s readymades as portable substitutions for

elements within the geography of Paris, from its monuments to its oxygen. This geographic interpretation of the readymades sees them as an aspect of Duchamp's quest for new forms of landscape representation. By capturing the air of Paris, Duchamp's readymade brought together earth and sky in tangible ways that he could transport on a boat across the Atlantic. The moment of the birth of the readymades has to do more with the new explorations linking earth and sky through aviation, however, than with boats.

Duchamp's Bicycle Wheel: A Kantian Object?

Consider the first readymade, the *Bicycle Wheel* or *Roue de bicyclette* (figure 3.2). Its forms bear examination in light of dialogues that had raged for more than a century about the nature of sculpture and the relationship of the base or plinth to the sculptural element above.⁴ In Duchamp's work, the wheel above requires the stool below in order to stand. Had it taken another form, its stem attached to floor or wall, it would have lost its portability. Hung from a hook, the wheel would have lost its ability to spin. Duchamp referred to this quality as the sculpture's *raison d'être*, claiming more than once that its spinning gave pleasure. For this quality of movement, the spinning *Bicycle Wheel* entered into the history of sculpture as, arguably, the first object designed as kinetic art.

Duchamp referred repeatedly to the kinetic qualities of his *Bicycle Wheel* giving him pleasure, in the way that a flickering fire gives pleasure. Borrowing this example from Kant's *Critique of Judgment*, Duchamp found a way to engage Kantian aesthetics without subscribing to them. Despite his friendship with the Puteaux group, he turned away from the neo-Kantian ambitions of his brothers and their friends Albert Gleizes and Jean Metzinger, authors of *Du "Cubisme"* (1912).⁵ Reading Kant closely gave Duchamp avenues to undo art's allegiance to the tyranny of taste, most notably through an alliance with categories that landed outside the purview of aesthetic judgment. The readymades were conceived amidst a contemplation of Kantian traditions, as emblemized in Duchamp's comments relating *Bicycle Wheel* to a flickering fire. Fire is not a beautiful object, though one may have a beautiful view of it. As Kant wrote, "In the latter case taste appears not so much in what the Imagination apprehends in this field, as in the impulse it thus gets to fiction, i.e. in the peculiar fancies with which the mind entertains itself, whilst it is continually being aroused by the variety which strikes the eye. An illustration is afforded, e.g. by the sight of the changing

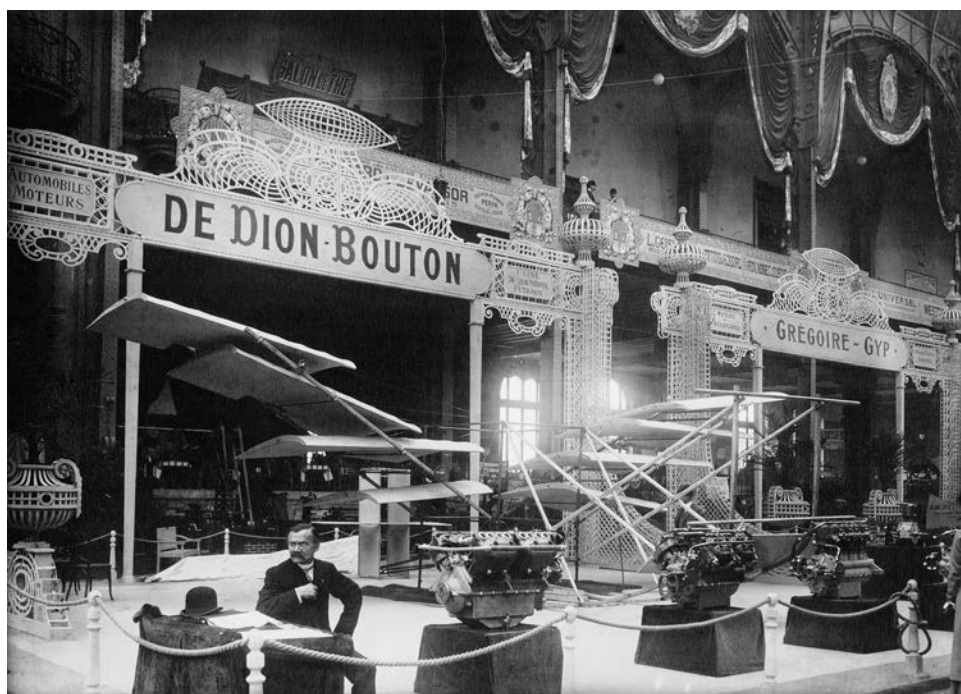
shapes of a fire or the hearth or of a rippling brook; neither of these has beauty, but they bring with them a charm for the Imagination, because they entertain it in free play.”⁶ A flickering fire need only embody “free play,” not beauty. To distinguish judgments of sense from those of taste, Kant used the example of the rose.⁷ In his later creation of “Rose” or “Rose” Sélavy, Duchamp may have knowingly played freely with Kantian thought.

Thanks to the *Bicycle Wheel*'s wooden stool below, the metal wheel above spins freely and can be reached by an audience that stands or sits. The ordinary qualities of this stool have likely deflected consideration of the exhibition practices then current at the Salon d'automne and elsewhere. There, the sturdy stools employed in artists' studios as working surfaces sometimes served double duty, as pedestals upon which to display sculptures. Contemporary photographs document artists at work using such stools and formal exhibition spaces as the Salon d'automne in which the stools support sculptures. By including this stool, *Bicycle Wheel* engages questions that would propel Duchamp's friend Brancusi across his entire career. The sculptor Auguste Rodin had challenged conventional wisdom about the relationship between a sculpture and its base, proposing to remove his *Burghers of Calais* from elevated pedestals so that audiences might walk among them. In Rodin's example, content and form worked together to promote a viewer's experience of identification and empathy with the sacrifice of the *Burghers*. *Bicycle Wheel* invited interaction, while blending display practices from museums with those of commercial stores, or the practices of trade fairs like the Exposition de la locomotion aérienne.

Airplane, Auto, Bicycle, Readymade:

Expositions internationales de la locomotion aérienne, Paris

How might the forms of the *Bicycle Wheel* be interpreted in light of Duchamp's visit to the Exposition de la locomotion aérienne? The spinning wheel physically embodies the idea of “locomotion.” This, of course, requires the multisensory interaction of an audience, who pairs tactile contact with dynamic movement and set it into motion. This offers a punning connection to the official title of the salon, the “Exposition de la locomotion aérienne,” an event that coincided with other artistic events of great significance for Duchamp. The convergence of contemporary art and aviation in autumn 1912 was powerful. In the Grand Palais, where avant-garde artists had exhibited their works in the Salon d'automne annually since 1903 (when

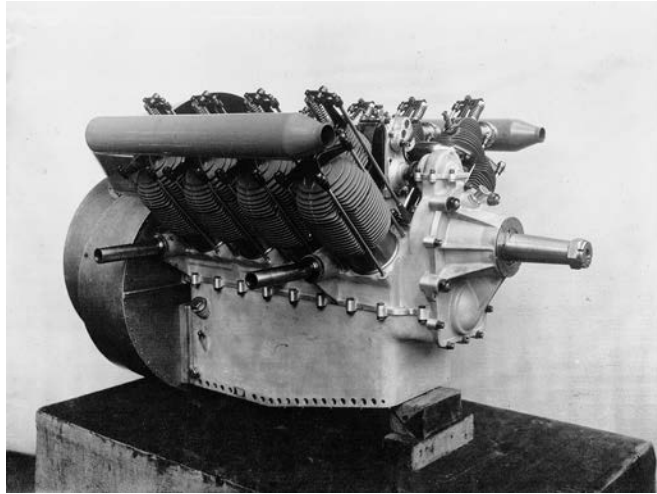


3.4. Exposition de la locomotion aérienne, 1909, De Dion-Bouton stand, exhibiting engines (foreground) and a ten-wing airplane. Misidentified as the “de Weiss” stand by the Bibliothèque nationale de France. Press photograph, Agence Meurisse. Modern digital scan from a glass negative, $5\frac{1}{8} \times 7\frac{3}{32}$ in. (13 x 18 cm). Collections of the Bibliothèque nationale de France, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.

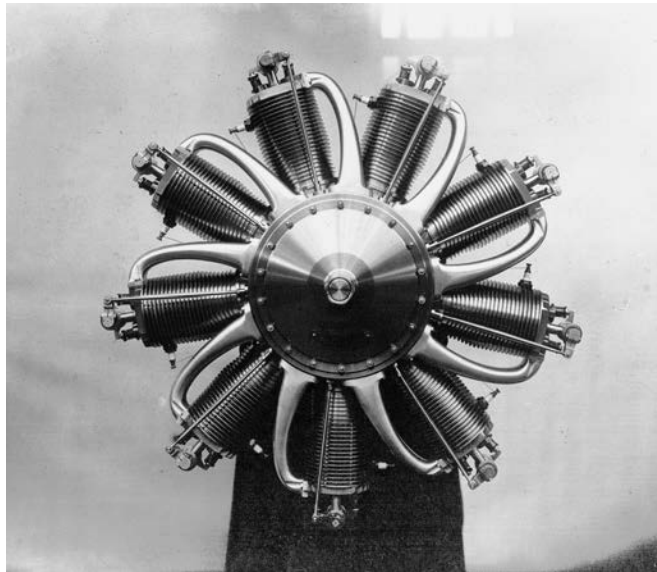
Jacques Villon helped organize the drawings section), the display period for that annual art event overlapped with that of the aviation exhibition. The two salons occupied different areas of the vast glass structure of the Grand Palais simultaneously during October and November. This was a time of enormous significance for the Puteaux group of artists. They organized their own autumn 1912 exhibition, the Salon de la section d'or (October 9–30) and were well represented at the Salon d'automne, where their works incited controversy. The Exposition de la locomotion aérienne featured aviation-related objects displayed as if they were artworks. A photograph of the De Dion-Bouton stand at the 1909 Exposition de la locomotion aérienne shows a line of engines displayed in a sculptural fashion at the edge of a barrier rope (figure 3.4, plate 9). Each engine in the photograph rests atop

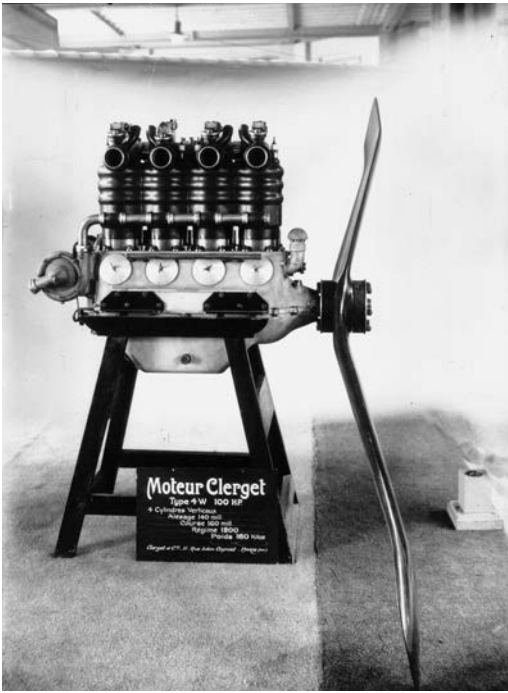
a draped box, enhancing sculptural associations. At the 1912 Exposition de la locomotion aérienne, spare parts were presented as distinctly sculptural objects (figures 3.5, 3.6, and 3.7). Propellers, motors, engines, and wheels were all given dramatic treatment akin to the display of sculptures. Their metallic forms were like those that inspired Picabia to create mechano-morphic drawings and paintings, while Brancusi and Duchamp took their inspiration into three dimensions.

3.5. Exposition de la locomotion aérienne, 1912, De Dion-Bouton engine (8-cylinder, 80 HP). Press photograph, Agence Meurisse. Modern digital scan from a glass negative, $5\frac{1}{8} \times 7\frac{3}{32}$ in. (13 x 18 cm). Collections of the Bibliothèque nationale de France, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.



3.6. Exposition de la locomotion aérienne, 1912, Rhône engine (9-cylinder, 80 HP, 110 kg), designed by Louis Verdet. Press photograph, Agence Meurisse. Modern digital scan from a glass negative, $5\frac{1}{8} \times 7\frac{3}{32}$ in. (13 x 18 cm). Collections of the Bibliothèque nationale de France, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.

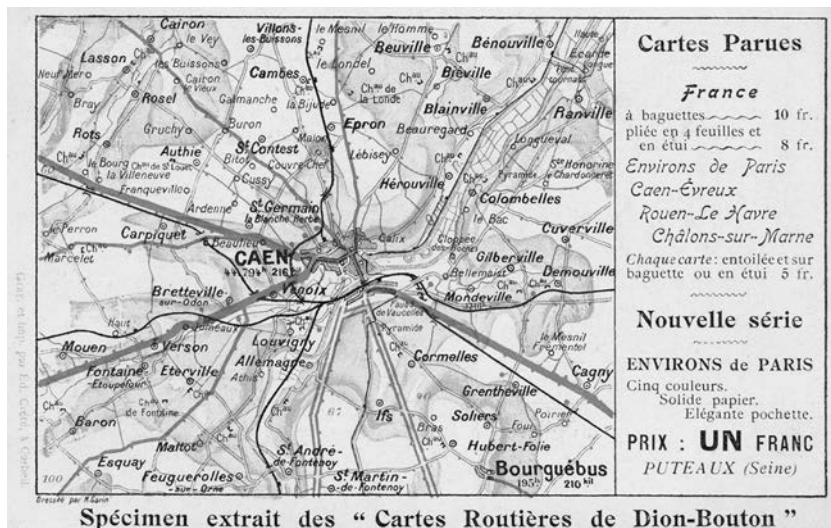




3.7. Exposition de la locomotion aérienne, 1912, Cynros rotary on a Clerget engine (“ailes rotatives Cynros sur moteur Clerget”), exhibited at the exposition. Press photograph, Agence Meurisse. Modern digital scan from a glass negative, $5\frac{1}{8} \times 7\frac{3}{32}$ in. (13 x 18 cm). Collections of the Bibliothèque nationale de France, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.

Automotive pioneers De Dion-Bouton figured prominently among the exhibitors whose wares Duchamp encountered at the Exposition de la locomotion aérienne. By 1912, De Dion-Bouton was recognized worldwide as an innovator of the motorcar and, increasingly, of airplanes. Its significance for global industry in these emerging fields had patriotic dimensions for many who visited the Exposition de la locomotion aérienne or read about the firm in the news, occasional flares of labor unrest notwithstanding.

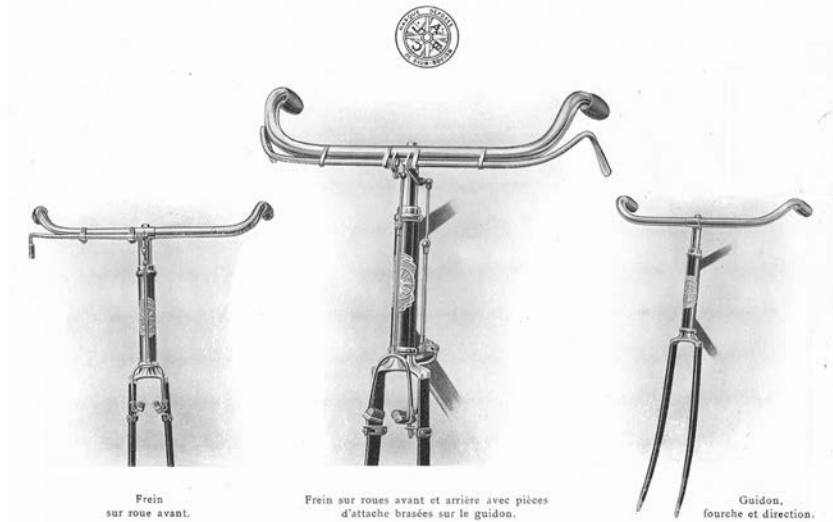
The large De Dion-Bouton factories were unmistakable fixtures of the physical and social landscapes of Puteaux. They were located less than a kilometer from the homes of Duchamp-Villon, Villon, and František Kupka. Known for their manufacture of automobiles, omnibuses, tricycles, and bicycles, they pioneered the design of the ubiquitous Parisian “arroseur” water-spraying, street-cleaning vehicles. To promote automotive tourism and guide prospective motorists, they commissioned and published the “Cartes Routières De Dion-Bouton,” detailed maps that connected to chart the nation’s roadways (figure 3.8, plate 10). Today De Dion-Bouton is mostly forgotten, save for the efforts of automobile enthusiasts who recognize the company’s pioneering significance.



3.8. "Specimen extrait des 'Cartes Routières de Dion-Bouton,'" map on postcard, ca. 1900. Collection of the author.

De Dion-Bouton began in 1883, founded by the entrepreneurial marquis Jules-Albert de Dion with engineers Georges Bouton and Charles Trépardoux. The trio began collaborating on a project to design a steam-driven motorcar in 1882, at which time the engineers were designing scientific toys in an atelier near the Porte de la Chapelle in the north of Paris.⁸ In 1883 the group opened its factories on the banks of the Seine at 36, Quai National, Puteaux, later opening additional factories in Puteaux on the rue des Pavillons and eventually at 12, rue Ernest.⁹ Its steam-driven motorcars were successful in early automotive races, including the significant 1894 Paris-Rouen Concours du petit journal *Les Voitures sans Chevaux*. By 1900, De Dion-Bouton was recognized as the world's largest manufacturer of automobiles, producing four hundred vehicles and 3,200 engines annually. As this statistic indicates, much of De Dion-Bouton's production was concentrated in isolated engines subsequently sold to other automobile manufacturers.

The De Dion-Bouton factories at Puteaux were known for employing modern production techniques, including the fabrication of interchangeable parts or "pièces détachées," displayed in the firm's stands at automotive and aviation salons. Advertisements from popular publications such as *L'Illustration* and contemporary catalog illustrations (figure 3.9) show



3.9. Advertisement from Cycles De Dion-Bouton 1911 catalog. Private collection, France. Photo courtesy of Bruno Guasconi.

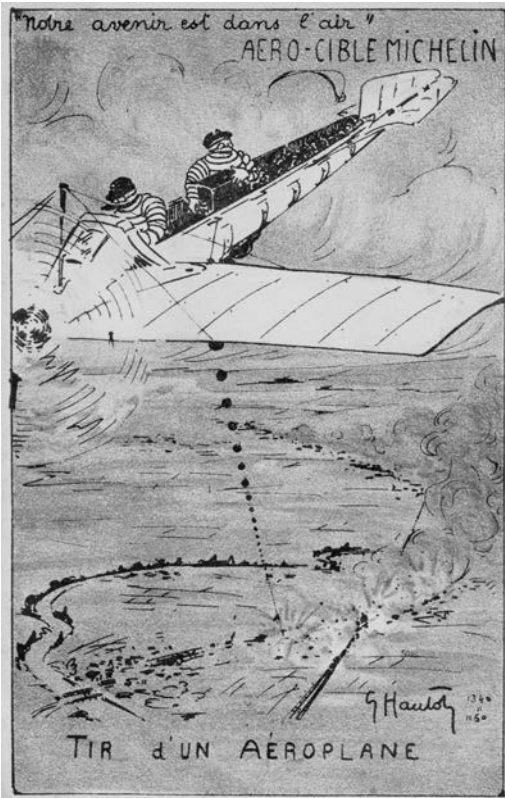
isolated elements such as handlebars and bicycle forks that could have inspired Duchamp to assemble his sculptural *Bicycle Wheel*.¹⁰ “De Dion-Bouton rolls on its own,” proclaimed an advertising campaign at the start of the twentieth century, emphasizing the effortless glide of their wheels in an image that shows a cyclist chasing his unoccupied moving bicycle (figure 3.10, plate 11). Judging from this image alone, the kinetic beauty of the De Dion-Bouton bicycle wheel was apparent.

Bicycle wheels figured significantly in the Exposition de la locomotion aérienne before 1914. Early aviation built its early experimentation upon the mechanics of the automobile and the bicycle. Celebrated aviation pioneers Wilbur and Orville Wright were frequently depicted in the popular press as tinkering bicycle mechanics, their expertise in bicycle repair contributing to the experimental construction of the first aircraft to achieve an extended self-propelled flight.¹¹ Bicycles and airplanes went together in the popular imagination of the early twentieth century.

Though better known today for their automobile tires, the Michelin company stood out among the most vocal proponents of early aviation in France. Makers of tires for automobiles and bicycles, they pioneered early aviation and pushed the French government to augment its military efforts by investing in airplanes. One of their efforts at combined commercial



3.10. Unidentified artist, De Dion-Bouton advertisement postcard, ca. 1900.
Collection of the author.



3.11. Georges Hautot, "Notre avenir est dans l'air: Aéro-cible Michelin" (Our future is in the air: aerial bombing competition by Michelin), postcard, 1912. Produced by Michelin for promotional distribution at the fourth Exposition de la locomotion aérienne, 1912. Collection of the author.

promotion and political lobbying was a highly effective campaign titled "Notre avenir est dans l'air" (figure 3.11, plate 12). Historians of modern art recognize that phrase from the title of a pamphlet Picasso included in two Cubist still-life paintings.¹² A million copies of this forty-page pamphlet by André Michelin were printed and distributed beginning in February 1912, to rally popular political support for national investment in aerial defense. Beyond the pamphlet, an expanded campaign disseminated visual imagery through prints, postcards, and other means. Figure 3.11 (plate 12), an image by illustrator Georges Hautot taken from this series, is like those that were distributed at public venues, including the Exposition de la locomotion aérienne, beginning in 1911. These postcards used the commercial of Michelin's mascot Bibendum (the trademark "Michelin Man") as aviator to create an iconography of aerial warfare before such practices became commonplace. Among the multiple aspects of Michelin's campaign were prizes for aeronautic accomplishments and regularly scheduled tournaments to

practice aerial bombing of targets on the landscape below. Concurrent with the 1912 Exposition de la locomotion aérienne, Michelin promoted the first such event, a “concours de l’aéro-cible.” Whereas Picasso engaged Michelin’s radical politics of aerial warfare with Cubist still-life paintings, Duchamp responded to aviation’s challenges by launching a new sculptural category of the readymade.

Triumphal Parades of Aviation through the Streets of Paris

When Duchamp visited the fourth Exposition de la locomotion aérienne in 1912, these exhibitions had yet to emerge from their relative infancy. Regular events, their timing was not yet regularized; the fourth Exposition de la locomotion aérienne (October 26–November 10, 1912) was the second to be held in the calendar year 1912, the previous having taken place from December 16, 1911 to January 2, 1912. Although greater significance would later be accorded the salons as a sign of French national progress and economic prowess, the early salons were already organized with these goals. In this regard, their faith in progress and celebration of industrial technology shared much with the reigning exhibition ethos that world’s fairs held in common with museums of science and technology such as the Conservatoire national des arts et métiers (CNAM).¹³

Precedents had been set for mixing earth and sky in the Paris world’s fairs. Balloons appeared alongside early automobiles in the centennial exposition of 1889. Clément Ader (1841–1925) crafted a bat-like flying machine that was displayed alongside automobiles in the Palais de l’Industrie in 1901. Ader coined the French term for an airplane, *avion*—etymologically derived from *aves* or *avis*, meaning bird—after the successful inaugural flight of a plane called the Eole on October 9, 1890.¹⁴ This brief flight totaled only fifty meters traveled from a height of twenty centimeters, yet it was powered by a steam engine. In an event perceived as a victory for French ingenuity, Ader’s flight was proclaimed the first example of a self-propelled airplane taking off from level ground. By 1902, a later incarnation of Ader’s flying machine, the Avion III of 1897, entered the collections of the Conservatoire national des arts et métiers. Inside the CNAM, the sixteen-meter wingspan of Ader’s silk and wood creation appeared strikingly sculptural against the gothic and baroque decor of the former abbey. Ader’s design, based on his study of the flight of birds, bats, and flying foxes, blended the organic forms of these creatures’ anatomy with two inorganic steam

L AVIATION PAR L'IMAGE



Offert par les Produits Nyrdah

L'APPAREIL BLÉRIOT AU CONSERVATOIRE DES ARTS ET MÉTIERS

*Le 13 octobre 1909, a été transféré au Conservatoire des Arts et Métiers l'appareil avec lequel Blériot a traversé la Manche.
L'appareil demeurera parmi les collections nationales auprès de l'Avion d'Ader, non loin de la première automobile de Cugnot.*

3.12. Advertising card with photograph from October 13, 1909, parade to escort Louis Blériot's plane through the streets from the Exposition de la locomotion aérienne to the Musée des arts et métiers, Paris. Collection of the author.

engines to power its propellers. Ader's Avion III was transported through the streets of Paris from the Musée des arts et métiers to the Grand Palais to figure prominently in the automotive exposition of 1908. This marked the most immediate precursor to the first Exposition de la locomotion aérienne, held September 25–October 17, 1909.¹⁵

Ader's plane's procession was echoed by another, held on October 13, 1909, to honor aviator Louis Blériot (1872–1936). Crowds accompanied Blériot's plane from the Exposition de la locomotion aérienne to the Musée des arts et métiers in a parade through the streets of Paris (figure 3.12).¹⁶ As pioneers of aviation whose creations were enshrined in the museum, Ader and Blériot stood as fitting figures for comparison with artists of the day. In his book-length essay *The Cubist Painters: Aesthetic Meditations* (written in late 1912, published 1913), Guillaume Apollinaire compared Duchamp to Blériot and to the early Italian Renaissance painter Cimabue (died 1302) in prophetic ways, pointing to the Renaissance traditions of religious processions. "Just as a work by Cimabue was paraded through the streets, our century has seen Blériot's airplane, bearing the weight of humanity, of

thousands of years of endeavor, and of necessary art triumphantly paraded through Paris to the Arts et métiers museum. It will perhaps fall to an artist as free of aesthetic considerations and as concerned with energy as Marcel Duchamp to reconcile Art and the People.”¹⁷

Each incarnation of the Exposition de la locomotion aérienne through 1938 was held in a setting of pomp and glory crafted by designer André Granet (1881–1974). As designer of the annual automotive salons, Granet was among those responsible for the idea of a recurring aviation salon to parallel the celebration of the motorcar. Granet founded the “Association des industries de la locomotion aérienne” with his friend Robert Esnault-Pelterie (1881–1957), a pioneering aviator and airplane manufacturer. Other aviators and industrialists united on the salon’s executive commission to promote aeronautics, including well-known names such as Blériot, Ader, Maurice Mallet, and Paul Tissandier (son of Gaston Tissandier, longtime proponent of popular science and publisher of *La Nature*).¹⁸ The fourth Exposition de la locomotion aérienne, which Duchamp visited in 1912, was the first to exclude hot air balloons (a fixture since the first salon) in favor of modern motorization. Aviation joined earth and sky. It gave flight to the camera’s eye that would document celestial and terrestrial geographies anew. Meanwhile, on the ground, popular geographies and tourist guide-books alike promoted navigation by way of urban monuments. Through acts of substitution, Duchamp’s readymades created surrogate geographies of the streets of Paris, accompanied by shifts in scale and processes of miniaturization as practiced by artists and industry before him.

Miniaturization and the Monument;
or, the Bibelot and Bartholdi

Artists working in the Western tradition have played with scale, mechanical repetition, and multiplicity since ancient times. Roman collectors who prized Greek artworks systematically copied the sculptures of their predecessors using mechanical means. Such an approach to mechanical reproduction made it easy for the Romans to play with sculptural scale and media. Eighteenth- and nineteenth-century sculptors used scale and materials as marketing tools to diversify audiences and maximize profits. Sculptors and architects sold scaled-down editions of their works, often capitalizing on the visibility of their public monuments or works commissioned by notable patrons. Creators such as the renowned French animal artist Antoine-Louis

Barye (1796–1875) sculpted works on a tabletop scale to appeal to a wide range of collectors; these were conceived as complements to, or copies of, larger-scale works intended for public display and financed through government patronage.¹⁹ At times, these small-scale sculptures risked slipping from the prominence of art to the lower status of the bibelot. In his study of nineteenth-century consumer practices, scholar Rémy Saisselin distinguished the bibelot—a commercially produced, affordable multiple, whose meanings were stereotypically predetermined—from works of art, the two occupying different levels of an aesthetic hierarchy.²⁰ Rodin priced his sculptures depending on their scale and the materials employed. After being received with unprecedented public approval upon its first exhibition (at the Salon de mai, 1898), *Le baiser* (*The Kiss*) could be purchased in carved stone or cast metal. To meet popular demand for the sculpture, and distance himself from serial merchandising, Rodin agreed to a twenty-year contract for the Paris-based foundry Gustave Leblanc-Barbedienne to reproduce *The Kiss*. Known for selling editions of sculptures by Barye and others, Barbedienne made and sold 329 casts. In a highly publicized court case, Barbedienne was found guilty of exceeding the terms of the contract and making undocumented reproductions after the sculptor's death.²¹ The palpable eroticism of *The Kiss*, its phenomenal popularity, its existence at multiple scales, and its expanded reputation as a reproduction may have been qualities that attracted Duchamp to it.²² Duchamp's fascination with these methods for scalar production, and reproduction, extended to their application in commerce.

When Duchamp arrived in New York in 1915, the name of one French artist above all others would have been recognized by the majority of Americans: Frédéric Auguste Bartholdi, sculptor of the Statue of Liberty (*Liberty Enlightening the World*). In Paris and New York, Duchamp regularly encountered Bartholdi's work, with its sculptural achievements of multiplicity, self-repetition, and scale.²³

Bartholdi's statue not only allegorized *Liberty* but also symbolized Franco-American exchange. Given that Duchamp remained engaged with, promoted, and at times seemed to embody Franco-American exchange, he had great cause for interest in Bartholdi's work. Duchamp referred to Bartholdi's *Liberty* in a book cover he designed for André Breton's *Young Cherry Trees Secured against Hares* (1946). *Etant donnés* (1946–66) takes on new meanings when seen in light of Breton and Duchamp's shared discussions of *liberté* and Bartholdi's *Liberty*. Although the art historian David Hopkins and other

scholars have connected Duchamp's late work with the Statue of Liberty, the significant example of Bartholdi for Duchamp's readymades merits consideration. Popular understanding of Bartholdi's significance arguably rests upon the familiarity of *Liberty* herself; deeper analyses of Bartholdi's successes emphasize his iconographic or technological innovations. Bartholdi's career showcased his ability to shift a sculpture's scale to suit the demands of public sculpture. This facilitated the reproduction of his work on a variety of scales. Prior to sculpting *Liberty*, the *Lion of Belfort* (1880) was his most impressively colossal work; made of pink sandstone quarried in the Vosges mountains, the eleven-meter lion stretches twice that length and appears to fill the mountainside that rises above the town of Belfort. The French nation in 1880 erected a one-third scale copy of the lion, made of hammered black-patinated copper, in Paris. This statue there commemorated the defense of Belfort during the Franco-Prussian War by commander Pierre Philippe Denfert-Rochereau, known as "the lion of Belfort" for his military achievement. The sculpture was placed at the center of the Place d'Enfer to accompany its rechristening as the Place Denfert-Rochereau.²⁴ Bartholdi's smaller lion occupied the intersection nearest the apartment of Duchamp's close friend H. P. Roché, in the shadow of l'Observatoire de Paris, where it may still be seen today.

If shifts in scale were a key to Bartholdi's success as a sculptor of public commissions, such shifts could also provide significant means for financial gain. Creative financing stands among the greatest accomplishments in realizing the colossal statue of *Liberty*. Although the story of the subscription to finance the statue is frequently repeated, less is known about the merchandising gambits employed by Bartholdi and his collaborators to raise funds for the statue's completion. In addition to the scale models the sculptor made to plan *Liberty* and to present the sculpture to audiences (from public salon audiences, as in 1873, to investors and subscribers, later), Bartholdi made and authorized others to reproduce scale models.

Bartholdi exhibited fragments of the sculpture-in-process in two world's fairs. *Liberty's* right arm holding the torch aloft appeared in Philadelphia for the 1876 Centennial Exhibition (subsequently transported to Madison Square Park, it remained on display in New York City until the statue was assembled on Bedloe's Island; the flame was later placed near the Pont de l'Alma, in Paris). For the 1878 Paris World's Fair, *Liberty's* disembodied head became a popular exhibit upon the Champ de Mars. At the same time that these monumental fragments captivated public attention from afar,

tourists could purchase small-scale versions of *Liberty* as souvenirs. Specialists in making “imitation bronze” through a process that lent new patination to zinc, Avoiron et Cie. offered small busts of *Liberty* to audiences beginning in 1878. In Philadelphia and in Paris, some of the less expensive metal reproductions and tourist mementos were stamped with the name of “Gaget, Gauthier et Cie.,” the company responsible for fabricating the hammered copper exterior of the colossal statue. Specialists in plumbing, water pipes, and the production of “artistic metals,” Société Gaget, Gauthier et Cie. were based at 25, rue de Chazelles in the sixteenth arrondissement of Paris. Oft-reproduced imagery from the day showed the colossal *Liberty* rising above the extra warehouse spaces they rented to complete the enormous commission.²⁵ Popular etymologies of the term “gadget” attribute the word’s origin to these metal tourist trinkets.²⁶ Though this may be more legend than truth, it testifies to the long-lived fascination with miniatures stamped “Gaget, Gauthier et Cie.”

Bartholdi retained rights to market models of the sculpture in terracotta and bronze, while granting contracts to Avoiron et Cie. to reproduce them in other materials from 1878 to 1886. The most renowned of these facsimiles became known as the “American Committee Model.” Newspaper advertisements announced subscription sales of a miniature statuette, described as “a perfect facsimile of the model furnished by the artist,” available in six- or twelve-inch heights and sold through the American Committee of the Statue of Liberty.²⁷ Some of the variations in the Avoiron casts and American Committee models employed an electric bulb or gas jet to illuminate *Liberty*’s torch.²⁸ By thus engaging with the new domestic technologies of interior lighting in their day, Avoiron’s reproductions fancifully modified and “updated” *Liberty*. In a similar vein, an advertising image by Currier and Ives (circa 1885) shows *Liberty* transformed; instead of a torch, she holds aloft a “Star Lamp” of the variety marketed by Holmes, Booth, and Hayden of New York (figure 3.13). Bartholdi integrated gas lighting in his designs for fountains, including a design he presented at the Centennial Exhibition of 1876 that was subsequently purchased by the U.S. government and erected in Washington, D.C. Whether through his 1917 *Fountain* or the gas-lamp-bearing hand in *Etant donnés*, Duchamp’s career intersected at many points with that of Bartholdi, his predecessor in Franco-American artistic exchange.

In Duchamp’s time, *Liberty* stood alongside the *Mona Lisa* as one of the most reproduced artworks of all ages. Multiplicity is a central aspect of its



3.13. Currier & Ives, "The great Bartholdi statue, Liberty enlightening the world with the world renowned and beautiful Star Lamp" (advertisement for a "Star Lamp" of the variety marketed by Holmes, Booth, and Hayden of New York), 1885. Lithograph, tinted. Courtesy of the Library of Congress, Washington, D.C.

reputation. Bartholdi donated his working model in bronze to the Musée de Luxembourg in 1900, which installed it in the Luxembourg gardens in 1906. Another stands on the Île aux Cygnes, near the Pont de Grenelle, in the Seine. Bartholdi's widow bestowed a substantial collection of archival materials and objects upon the Musée des arts et métiers, along with finances for the preservation and exhibition of these materials. One of the donated models of *Liberty* appears centrally in the photograph of the museum shown in figure 1.11. The Bartholdi donation included metal and plaster versions, and even a model of *Liberty* whose base contained a diorama that had drawn immense crowds and great popularity when exhibited in

Paris, 1878.²⁹ Replicas of Bartholdi's sculpture were placed in cities as far as Hanoi, Vietnam, in the years before 1900.³⁰ From the time of his arrival in Paris, Duchamp would have walked past replicas of Bartholdi's *Liberty* in a variety of places, from the streets of Paris to the Musée des arts et métiers.

Small casts of *Liberty* were not the only monuments available as tourist trinkets. Monuments transformed into scale replicas, or into objects of utilitarian function (bottle openers, scissors, and the like) proliferated for the emerging tourist classes. Travelers to Paris world's fairs in 1889 or 1937 could bring home inkwells that assembled monuments from diverse corners of Paris, playfully recombining the landscape in a single small object. Sometime after 1900, manufacturers brought out scale models of the new Montmartre basilica, the Sacré-Cœur.³¹ A visitor to the 1889 exposition commented on these ubiquitous miniatures: "Is it necessary to enumerate the models of the [Eiffel] Tower in leather, gold, silver, lead, nickel, rolled gold, zinc, crystal, which have no practical usefulness and which one puts in one's pocket simply to possess as a good luck charm the colossus of the Champ-de-Mars?"³²

Miniature Landscapes

Duchamp's early readymades connected with sculptural traditions of miniaturization that preceded the popular culture of miniature parks. In such parks, recognizable monuments from around the world were re-created on a small scale. Bekonscot Model Village in the UK and Madurodam in the Netherlands opened in 1929 and 1952, respectively. The origins of tourist attractions such as these remain to be studied. Their European appearance may have been inspired by enthusiasts of model railroads or perhaps by the miniaturization processes of Japanese bonsai-style miniature gardens popular in the late nineteenth and early twentieth centuries.³³ Bonsai plants attracted popular attention at world's fairs at least as early as the Philadelphia Centennial International Exhibition of 1876.³⁴ French audiences enjoyed their appearance at the Paris fairs of 1878, 1889, and 1900 where they referred to bonsai plantings as *paysages nains*, or "miniature landscapes."³⁵

Just as nature could be tamed and mastered by human technological ingenuity, it could also be domesticated and presented as popular entertainments through reduced-scale reproductions. When the 1915 Panama-Pacific International Exposition was held in San Francisco, it featured reduced-scale models of the Grand Canyon and the recently completed

Panama Canal. Visitors could experience the canal “in gigantic miniature,” to borrow the paradoxical phrase employed by art historian Sarah J. Moore in her analysis of the miniature canal.³⁶ Tiny boats plied the simulated canal waters and passed through working miniature locks to give viewers a sense of verisimilitude as they observed the immense model. In the exposition’s Palace of Liberal Arts, colossal cartography represented the canal in a relief map fifty-by-twelve-feet large, and a reverse scaling produced a twenty-one-foot-tall working model of an Underwood typewriter weighing fourteen tons.³⁷ Nearby on the San Francisco exposition grounds, exhibits re-created the Grand Canyon and Yellowstone Park with topographic accuracy on a similarly grand miniature scale (each covering between five and six acres inside of enormous temporary halls). Positioned at the intersections of the fair’s dual mission of education and entertainment, these sprawling miniature landscapes represent an early twentieth-century expansion of the moving panorama documented by media archaeologist Erkki Huhtamo.³⁸

Miniature landscapes certainly appeared before this time, as museum models such as those in the Deutsches Museum and, with geographic precision, in the military planning models maintained in the Musée des plans-reliefs, Paris. Whether faithful to actual landscapes or fanciful, such models played a role in Victorian childhood entertainments. Elaborate miniature townscapes made of ordinary objects appeared in E. Nesbit’s children’s novel *The Magic City*.³⁹ Nesbit’s story revolves around the adventures that befall two children who magically shrink to inhabit the city one of them, young Philip Haldane, has built in play. To promote the novel’s sales, Nesbit staged her own *Magic City* at the Children’s Welfare Exhibition held in Olympia, UK, from December 31, 1912 to January 11, 1913. Within the confines of an exhibition booth, Nesbit erected a city to correspond to the one made by the child in her novel, alongside which she displayed the drawings made for the novel by illustrator H. R. Millar.⁴⁰ As biographer Julia Briggs notes, contemporary books by Nesbit’s close friend H. G. Wells similarly expanded on the notion of miniaturized towns and monuments. In *Floor Games* (1911) and *Little Wars* (1913), Briggs suggests, Wells “lays down some of the principles for modern war gaming, while adding . . . how much better it would be if all wars were confined to nursery floors.”⁴¹ Nesbit elaborated the *Magic City* concept in *Wings and the Child; or, the Building of Magic Cities* (1913).⁴² In this well-illustrated book, she combined a manual describing how to build magic cities with her own treatise on the significance of imaginative play for childhood development

and growth. As literary scholar Jenny Bavidge has noted, the interest in imaginative play and miniature cities shared by Wells and Nesbit reflects a more generalized fascination with urban planning and the emergent study of childhood play in the early twentieth century.⁴³ Childhood, play, and even humor were taken seriously by the nascent disciplines of sociology and psychology.

A larger history of playful engagement with monuments would include the French *jeu des monuments*, a board game known from the eighteenth and nineteenth centuries. Historian Annie Gérin has commented on one version of the game, writing,

The spiral path leads players along a tour of Paris' great architectural monuments. Each square is illustrated with a detailed etching of la Porte Saint-Denis, le Palais Royal, le Quay d'Orsay, la Colonnade du Louvre, le Panthéon, l'Hôtel des Invalides, etc. Hospitals, bridges and the Paris morgue all assume roles in galvanizing the game, altering the course of players. The ultimate square, number 63, is occupied by the Arc de Triomphe. Above it floats a rooster in a sunburst, the symbol of the July Monarchy. . . . Le jeu des monuments de Paris is hence more than a simple game staged in a monumental setting. Following Alois Riegl's definition, it is in itself a monument, an object designed with the precise intention of maintaining present particular human deeds for future generations. It proposes a history of Paris through its monuments, leading up to the Napoleonic victory. But it also strategically stakes a place for the embattled July Monarchy on square 63.⁴⁴

Miniaturizing these monuments to the scale of a game board does not rid them of their enormous political or social potency. One finds notions of the miniature in tourist trinkets, games, parks, novels, and spectacular displays. In Duchamp's day, models would have also filled department store windows, using scale to trigger the imagination.

Generations of critics and artists interpreted the readymades solely as avant-garde acts of anti-art, works that replaced the notion of physical artistic craft with an intellectual act of choice. With the readymades, however, Duchamp engaged questions of geography and landscape not typically associated with sculpture. I argue that Duchamp used the readymades to translate the cityscape of Paris into sculptural form and to create a familiar landscape in his transatlantic studio. His readymades contributed to modern art's interest in the urban landscape in ways that have not been

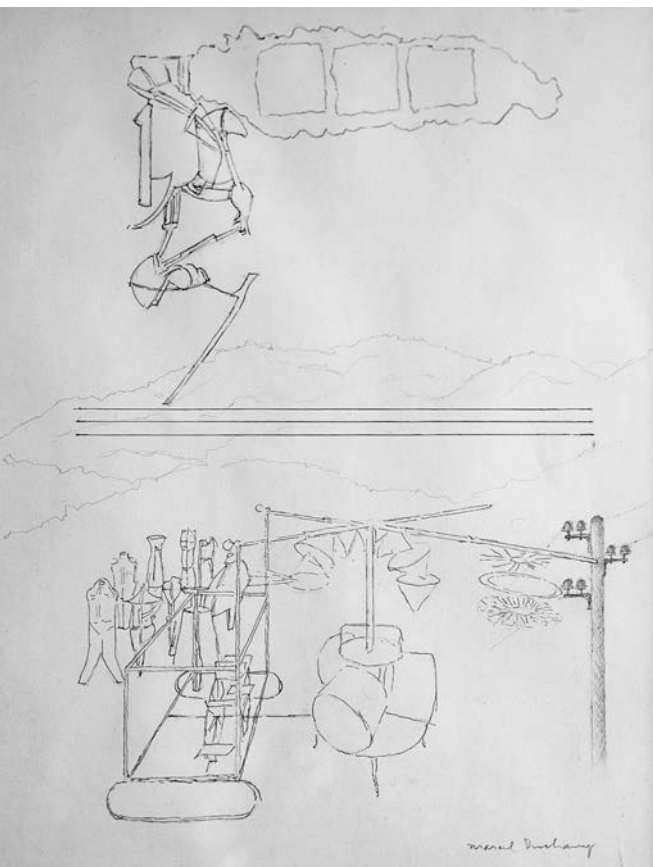
adequately recognized and offer a case study of the potentially complex interrelationships between modern art and geography. Only Duchamp's close friends and patrons could have seen groups of the readymades together in his New York City studio, a context that gave the objects personal levels of meaning.

Duchamp's readymades engage analogy, humor, and shifts in scale to translate elements of the human-made urban landscape into the interior landscape of the studio. Such shifts and translations parallel the physical and conceptual transformations of landscape into cartographic representations, or maps. Cartography translates physical and social forms alike, using codes of reference that remain internally consistent within a single map and throughout a series of related maps. As parallels to other forms of landscape representation, therefore, maps render landscape through specific coded representations, or "visual languages." Historians of cartography have pointed to veritable revolutions within modern cartography that occurred as this tool of geographical representation was used to quantify and catalog material, physical, and social landscapes in new ways during the eighteenth and nineteenth centuries. These new representations included thematic maps in addition to the previously established genres of cartography.⁴⁵ French cartographers embraced new techniques for the late-nineteenth-century mass production of color lithographic imagery, much as did their colleagues in printmaking and the poster arts.⁴⁶ Further studies of the transformations of the new cartographies of the fin de siècle period need to consider their ramifications beyond these technical and discipline-specific aspects. Interdisciplinary areas of inquiry that remain to be explored include cartography's relationship with the changing notions of representation that defined contemporary visual arts.⁴⁷

Landscape and *The Large Glass*

Duchamp's best-known work, *The Bride Stripped Bare by Her Bachelors, Even* (1915–23; also called *The Large Glass*; figure 1.2), had links to the landscape that are revealed in the notebooks and sketches Duchamp published at regular intervals.⁴⁸ Duchamp likened these accompanying notes to a Baedeker's guidebook or a Sears Roebuck catalog that might direct a viewer's experience of *The Large Glass*.⁴⁹

A 1959 drawing, *Cols alités (Bedridden Mountains)* places the mechanical forms of the bride and her bachelors among rolling hills; there, electrical



3.14. Marcel Duchamp, *Cols alités (Bedridden Mountains)*, 1959. Pen, ink, and pencil on paper. Private collection, Paris. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: Bridgeman Images.

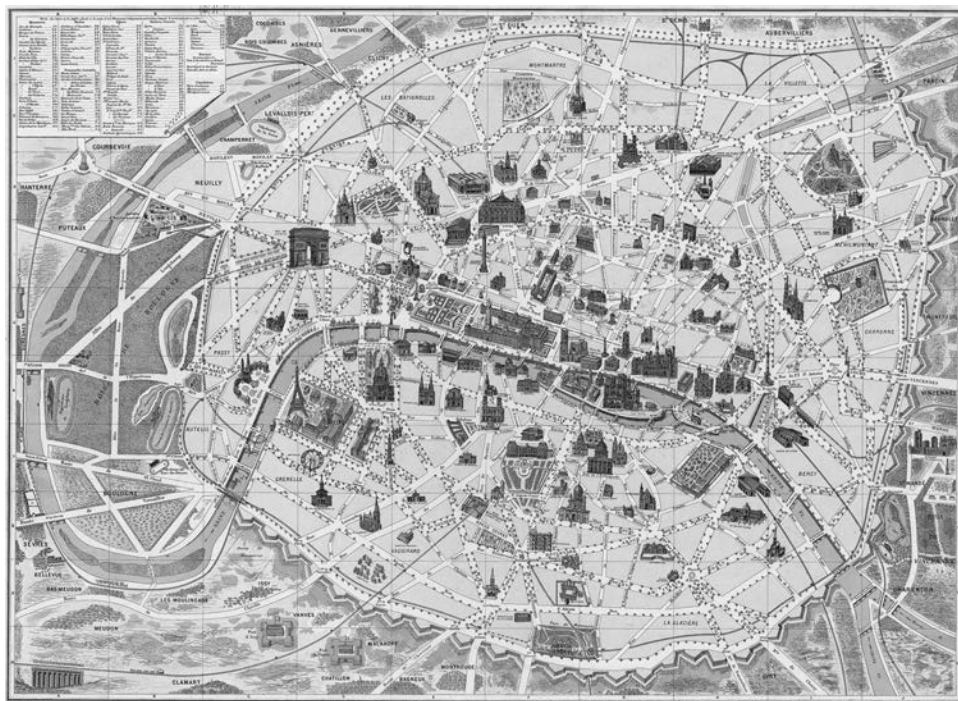
lines transform this into a distinctly modern landscape (figure 3.14). Modern elements distinguish *The Large Glass* from traditional landscape paintings in terms of both content and form. Scholarly literature on Duchamp has shown the diversity of the forces that motivated his work while emphasizing the quality of his art. The multivalency of *The Large Glass* may thus connect simultaneously to landscape aesthetics, to the frustrated desire of its bride and bachelors, and to popular science.⁵⁰ Duchamp's work challenged ideas of landscape representation and artistic traditions simultaneously.

Paris Monumental

Modern Paris was designed to be a city of monuments. Its appearance developed during the Second Empire, under the direction of Napoleon III and

Georges Haussmann. Before proclaiming himself Emperor Napoleon III, Louis-Napoleon Bonaparte wrote, "I want to be a second Augustus . . . because Augustus . . . made Rome a city of marble."⁵¹ In Paris, Napoleon III emulated the Augustan transformation of Rome from agricultural capital into imperial capital; the resulting "Haussmannization" demolished entire neighborhoods to make room for new, tree-lined boulevards and wide avenues. Haussmann's plans called for monuments to be set into the fabric of Paris as if they were gemstones set in jewelry. His grand boulevards focused attention on existing monuments (the Arc de Triomphe), expanded and completed others (the Vendôme Column), and made way for new monuments (the Palais Garnier, or Paris Opera).

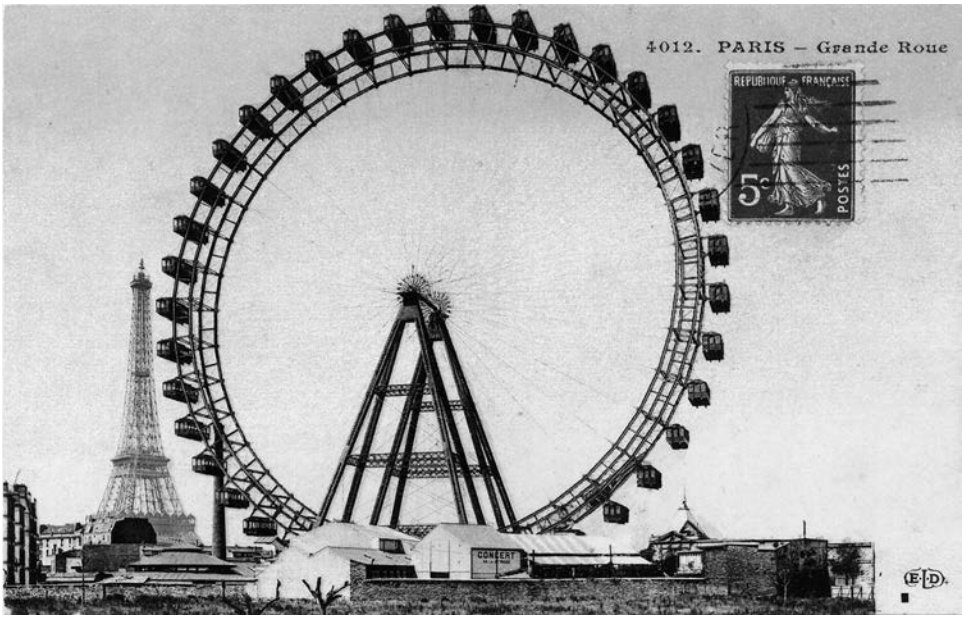
For the tourist or the pilgrim, monuments themselves, such as the Vietnam Veterans Memorial and Lincoln Monument in Washington, D.C., or the Eiffel Tower and the Basilique du Sacré-Cœur in Paris, may create the urban landscape by guiding and focusing one's experience of the city. The monuments' importance rivals that of physical geographical elements and may surpass their importance in shaping one's experience of the city. Maps such as the "Nouveau plan de Paris monumental" simultaneously display the city as a monument and as a collection of monuments (figure 3.15). Tourists visiting the Exposition universelle in Paris used such maps to guide them as they sought out the city's key cultural products. The power of these maps to shape a visitor's experience of the urban landscape of Paris continues today. Similar tourists' maps are distributed free of cost by the major Parisian department stores for their advertising value. On these, the sponsoring store becomes a monument that is the visual rival of the city's churches, monuments, and museums. Such maps build on the historical traditions of picture maps and maps presenting bird's-eye views of towns. Like picture maps of the monuments of Rome prized by pilgrims, maps of modern Paris offer tourism as a pilgrimage that is both secular and sacred, the latter punctuated by churches old and new. These representations of Paris parallel the representations of London that became popular during its transition to a modern urban force a century before; maps of both cities highlight the persistence of old monuments and urban forms alongside the proliferation of new ones. Although they use rational elements, such as the cartographic technique of isometric projection, maps such as the "Nouveau Paris monumental" willfully rearranged the orientation of the monuments they represented in order to display the most recognizable view of each. Mapmakers shifted the scales of the monuments, enlarging them to



3.15. “Nouveau plan de Paris monumental,” map published by L. Guilmin, 1899. Collections of the Bibliothèque nationale de France, Paris.

indicate their relative importance or shrinking them to conform to space limitations. Postcards from the early twentieth century show the grounds of the Exposition universelle with the Eiffel Tower and the Grande Roue (figure 3.16).

Before leaving Paris, Duchamp began his series of readymades by selecting objects that recalled the tower and the wheel. His 1914 *Bottle Rack*, a device on which to dry wine bottles for reuse, was among the first readymades, transformed from its utilitarian origins by the artist’s selection and signing of the object (figure 3.17). Its metal forms echo the cast-iron structure of the Eiffel Tower, a positive symbol of the city of Paris by Duchamp’s time. Although Duchamp’s contemporaries celebrated the tower’s modernity and its beauty, when it was built in 1889 it was derided by many who took offense at its unconcealed use of modern materials and the ugliness they perceived in its forms. Léon Bloy called it an iron Tower of Babel, deriding it as “a superb piece of hardware.”⁵² Duchamp’s *Bottle Rack* transformed a



3.16. Postcard, *La Grande Roue et la Tour Eiffel*, Paris, ca. 1900. Collection of the author.

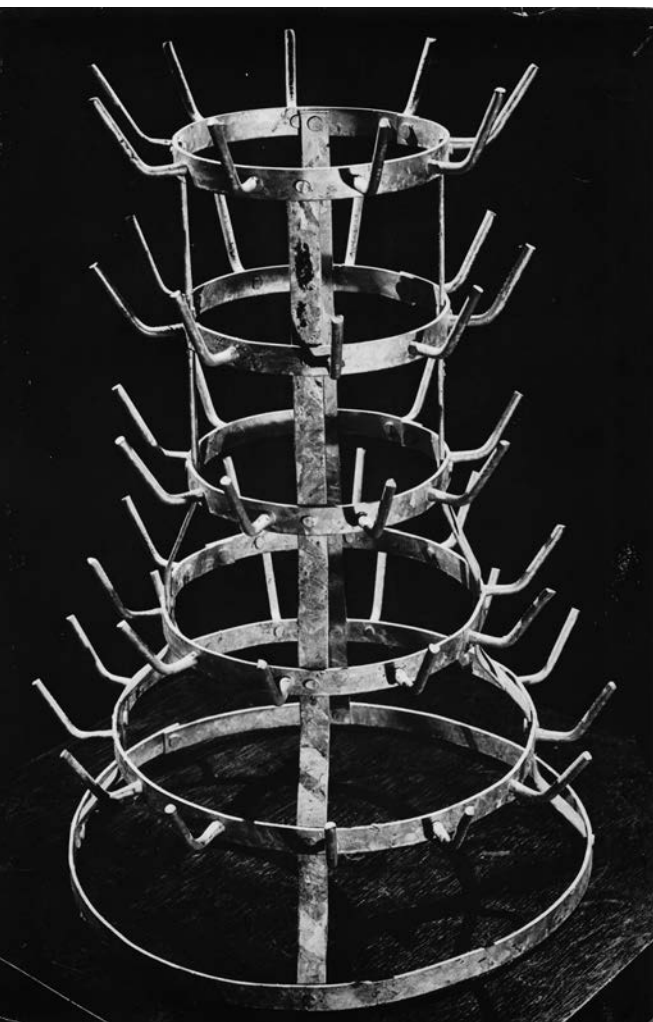
household object—a piece of hardware—into a sculpture of equally strange metal forms.

The link between *Bottle Rack* and the Eiffel Tower was strengthened by the readymade's companion in Duchamp's studio, *Bicycle Wheel* (figure 3.2). Its spinning form recalls that of the Ferris wheel, known in French as the “grande roue.” By finding minimal-scale substitutes for sites in monumental Paris, Duchamp's readymades engage an aesthetic approach that parallels the modernist concept of the object portrait.⁵³ Duchamp effectively established a “portrait” and a “map” of Paris that represented its landscape through reference to its monuments. From these first readymades on, the meaning of the objects would be specific.

When Duchamp left Paris for New York City in 1915, he had already completed three readymades. He arrived in a city characterized by its skyscrapers, of which the newest and tallest was the neo-Gothic tower of the Woolworth Building. He scrawled a note to himself that he later published: “Find [an] inscription for the Woolworth Building as a ready-made.”⁵⁴ Most scholars accept that the inscription was sought as if it were to be added to the Woolworth Building itself. Yet an inscription on an object in his studio would have introduced a substitute for the building into an inte-

rior artistic space, much as did the readymade sculpture *Paris Air* four years later (figure 3.3).

Paris Air, the modified ampoule purchased in 1919, was the fullest development of ideas Duchamp had begun with the first readymades in 1913. It is particularly emblematic because it brings part of Paris back to New York City in a very physical way. Its origins as a pharmaceutical ampoule link it to the second readymade, titled *Pharmacy*. To make *Pharmacy*, Duchamp added two spots of color—one red, one green—to an inexpensive print of a wooded scene, subtly transforming the banal landscape image with



3.17. Marcel Duchamp, *Bottle Rack*, 1914, replica purchased and photographed by Man Ray, 1936. Gelatin silver print, 11 $\frac{7}{16}$ x 7 $\frac{1}{16}$ in. Transfer from Department of Imaging Services, Museum of Modern Art, New York. © Man Ray Trust / © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp.

reference to the jars of colored water set in the windows of French pharmacies. Only through the titles' references and a viewer's understanding of culturally specific aspects of French tradition did works such as these take on any importance for the viewer.

The lack of visual interest that the readymades themselves offer is consistent with Duchamp's desire to shift modern art away from a purely visual tradition (which he decried as "retinal art") toward conceptual concerns, returning art to "the service of the mind." Duchamp discounted the readymades' aesthetic importance, turning away from the Kantian aesthetic tradition that defines art objects as "disinterested," nonutilitarian, and self-sufficient, requiring no further context or explanation. By contrast, in the intellectualized aesthetic proposed by Duchamp's readymades, the meaning of the works depends on the context of their exhibition as much as on the objects themselves. When first displayed in the artist's studio, the readymades were studio paraphernalia, personal objects whose importance most viewers would not recognize. On exhibit in a museum or gallery, their context (and therefore their meaning) changes.

Long after the first readymades were lost, Duchamp supervised the meticulous production of series of reproductions. The most notorious of the readymades was *Fountain* (figure 1.7). Before becoming a readymade it was simply a urinal. Duchamp modified it by signing and dating it, and rotating it so that it would rest on a sculpture stand rather than hang on the wall. He submitted it to the Society of Independent Artists' open exhibition of 1917. As a member of the society's supervisory committee, he submitted it under the pseudonym "R. Mutt," rather than reveal his affiliation with the object (given his reputation as the *Nude Descending a Staircase* Man, *Fountain* might have been accepted as a Duchampian joke; submitted by an unknown Mutt, its fate was complexified). Although iconoclastic, *Fountain* responded directly to the society's declared mission to remove contemporary art from earlier traditions of judgment and taste by accepting artworks from anyone who paid the exhibition fee. In this historically specific context, Duchamp's *Fountain* took its meaning from the society's response to the work, for it revealed the society's inability to follow its stated missions and goals to their logical conclusion.⁵⁵

Fountain's rounded forms echo those of a particular monument of the Parisian landscape, the Basilique du Sacré-Cœur (figure 3.18). Begun in 1871, the basilica was not consecrated until 1919, though its form was recognizable long before Duchamp selected his *Fountain* in 1917. Duchamp



3.18. Paul Abadie, architect, Basilique du Sacré-Coeur, Montmartre, Paris, 1875-1914 (consecrated 1919).

sketched the outline of its central dome in a pencil drawing made when he lived in Montmartre, in the shadow of the great church. The history of the Sacré-Cœur (Sacred Heart) is a case study in the cultural geography of modern Paris and of monumental urban construction in general. Although its forty-eight-year period of construction coincides with the development of modernism, the Sacré-Cœur has had a contested relationship with Paris and with modern art. The geographer David Harvey has contributed much to the critical understanding of Sacré-Cœur as an uneasy monument, a site that has remained mired in cultural conflict since its inception.⁵⁶ The basilica was built on a site where, during the political turmoil of the Paris Commune, police forces massacred citizens of Paris who had taken to the

streets to protest the social and political circumstances that followed the Franco-Prussian War. Pledging to build the basilica in a politically reactionary act of “atonement,” the “National Vow of the Sacred Heart” responded to this period of war.

Historian Raymond Jonas has chronicled the history of the concept of the Sacred Heart and its role in the life of modern Paris and of Catholicism across France.⁵⁷ Although the cult of the Sacred Heart has its origins in the reactionary royalist politics of the prerevolutionary period, Jonas sees the modern phenomenon of pilgrimage to the basilica as parallel to, and consistent with, the secular pilgrimages to world’s fairs and the café concerts, cabarets, and other celebrated entertainments of Montmartre. Amid this fin de siècle climate of Bohemian entertainment, the basilica “so animated local activity that, over time, Montmartre came to depend upon the Sacré-Cœur as much as the Sacré-Cœur depended on it.”⁵⁸ To this day the Sacré-Cœur retains its uneasy position as a monument built during the modern period, prospering under modern engineering and construction techniques, and yet delivering reactionary and premodern architectural, religious, and political messages to the city of Paris that expands beneath it.

Despite (or because of) this uneasy relationship with the twentieth century, many artists were drawn to the Basilique du Sacré-Cœur as a modern subject. Picasso and other modern artists painted this massive structure overlooking the city from the artists’ communities of Montmartre. When Duchamp first came to Paris, he lived with his brother on the Montmartre hill, in the shadow of the “white elephant,” as the structure has been called. Because of the size and the cost of the project, it was not completed until many years after the death of its designing architect, Paul Abadie. Throughout the many years of its construction, its oversized proportions and white exterior invited criticism from many camps. Critics condemned the basilica for its inappropriate pastiche of styles. Even today Parisians make light of its domes as “the breasts of Paris.” Those who negotiate the geography of Paris remark on the ideal location that the Sacré-Cœur occupies: from its steps one can take in the panorama of the city below. Walking in Paris, one is frequently surprised by repeated glimpses of the basilica rising in the distance. Despite its contested identity, the Sacré-Cœur assumed its place among the monuments of modern Paris even before it was completed.

Duchamp’s industrial-porcelain urinal, with its smooth, white surface, is a small-scale version that substitutes for the basilica. *Fountain* punningly echoes the distinctive form and color of the Sacré-Cœur. Although the

original *Fountain* disappeared before 1920, Duchamp later issued carefully crafted reproductions of the readymade, including standard-sized urinals and miniature versions such as those he placed at the center of his “portable museum,” *Box in a Valise (Boîte-en-valise)*. Before it disappeared, *Fountain* made its temporary home in Duchamp’s New York City studio, where he mounted it at ceiling level and photographed it. Within his studio, the location of *Fountain* makes a spatial reference to the northern, hilltop setting of the Sacré-Cœur. Like the great white basilica perched on the Montmartre hilltop, Duchamp’s urinal becomes a point of organizational reference for the other readymades. Just as the basilica can orient the traveler in Paris, *Fountain* provides context for the readymade *Hat Rack (Porte-chapeau)* and snow shovel (*In Advance of the Broken Arm*) by orienting them within the space of Duchamp’s studio.

Whereas *Fountain* is a visual pun on the Sacré-Cœur, *Hat Rack* makes playful linguistic reference to another northerly point within Paris, the city gate known as the “Porte de la Chapelle.” Visual and verbal puns were central to Duchamp’s art throughout his career. His emphasis on linguistic play is a reminder that the artist, the cartographer, and the geographer all engage in acts of representation that are inherently acts of translation. Verbal puns highlight the simultaneous fixity and frivolity of linguistic rules: for instance, if the French word for horse, *cheval*, takes plural form as *chevaux*, why shouldn’t *chapelle* (chapel) be made plural as *chapeaux* (hats)? The *Porte de la Chapelle* is thus given concrete form in *Porte-Chapeaux*, which hangs to the “east” of the northerly *Fountain* in Duchamp’s studio.

Monuments mark specific sites and also, through their memorial qualities, mark time. Thus they are effective forces in the creation of cultural landscapes. Pierre Nora and a team of scholars anchored this notion of memory places, or *lieux de mémoire*, in the collective French memory through a series of monuments that continue to shape personal and national consciousness in France today. Yet the very idea of the monument is dominated by sculptural and social conventions. Once established, the conventions of the monument retained an authority that has rarely been questioned. Why should the Column of Trajan in ancient Rome, or the Vendôme Column in the heart of Paris, take an architectural element, the column, as their form? Practices, conventions, and traditions make this not only acceptable but also expected, as the antiquity of the concept lends it prestige and continuity within the Western tradition. Because of its visibility and political associations, the Vendôme Column became a target of

Parisians' iconoclastic wrath. Targeting a Napoleonic monument, they expressed their anger against the government of Emperor Napoleon III and pulled down the column during the revolutionary period of the Commune. After his military victory at Austerlitz, Napoleon I ordered the repurposed cannons captured from his vanquished opponents to be melted down and used in the casting of this monumental column. That city gave the name



3.19. Marcel Duchamp, *La bagarre d'Austerlitz*, 1921. Two images, showing front and back of Duchamp's sculpture. Miniature window made by a carpenter to Duchamp's specifications, $24\frac{3}{4} \times 11\frac{5}{16} \times 2\frac{1}{2}$ in. (62.8 x 28.7 x 6.3 cm); wooden base, $1\frac{5}{16} \times 13 \times 7\frac{15}{16}$ in. (5 x 33 x 20.2 cm). Back painted in imitation brickwork, front painted gray; white marks like those made by a glazier drawn on the window panes. Staatsgalerie Stuttgart, Germany. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: © Staatsgalerie Stuttgart.



3.20. Pierre-Nolasque Bergeret and other sculptors, the Vendôme Column, 1806–11, in the Place Vendôme, Paris.

to a Paris railroad station that still operates today, the Gare d'Austerlitz, so named because trains traveled from there toward Austerlitz. Choosing the architectural element of a framed French window, Duchamp's readymade, *La bagarre d'Austerlitz*, refers to the train station and the Napoleonic battle at the same time (figure 3.19). In another act of domestication of the modern monument, its self-importance is deflated: the Napoleonic victory is reduced to a barroom brawl, or *bagarre*, and a lesser architectural element ironically replaces the heroic Vendôme Column (figure 3.20).

Duchamp's act was personal. By installing variants of Parisian monuments in his studio he created a nexus of power and memory that linked Paris with New York City. Yet the very functionality of the objects Duchamp chose for his readymades turned the idea of the monument on its head because, in contrast to other edifices, monuments are not built for functional ends. Duchamp's readymades set the stage for the artist, in a theatrical sense, by providing a Parisian backdrop in his New York City studio.

In his studio, Duchamp could be in Paris and New York City simultaneously. Such a situation hinges on the possibility (demanded by avant-garde

artists) that modern artworks foster multiplicity of meanings instead of singular interpretations. The complex, layered associations of the readymades are consistent with the multiplicity of meanings found, individually and collectively, in the works that make up Duchamp's entire creative output. For Duchamp, things were never only what they appeared to be.

Back in Paris a few years later, Duchamp and Man Ray joined together in director René Clair's film *Entr'acte* (1924). Clair juxtaposed the landscape of Paris with a game of chess. Perched high atop the roof of a Parisian building, Man Ray sat across a chessboard from a decidedly windblown Duchamp in the short film. Smokestacks and ventilators from a nearby roofline echoed the forms of the chessmen upon the board between the artists. In this Dada exercise in film-as-play, flux remains the only constant. Echoing Duchamp's art of substitution, in which the readymades could "become" surrogate monuments, Clair's use of cinematic montage and layering transformed the chessboard into a grid of Parisian boulevards. Moving back and forth from the street to the rooftop, Clair juxtaposes the two sites, ultimately substituting one for the other. Movements of the people on the city streets echo the moves of the pawns upon the chessboard. The scene closes when a stream of water from a fireman's hose chases figures off of the streets of Paris before becoming a water jet fired across the rooftop. Dancing waters topple the chess pieces and, in the end, upset the chessboard itself. No matter; the monuments could be moved, and rearranged, again. Besides, Man Ray and Duchamp had parlayed their collaborations into something like stardom.

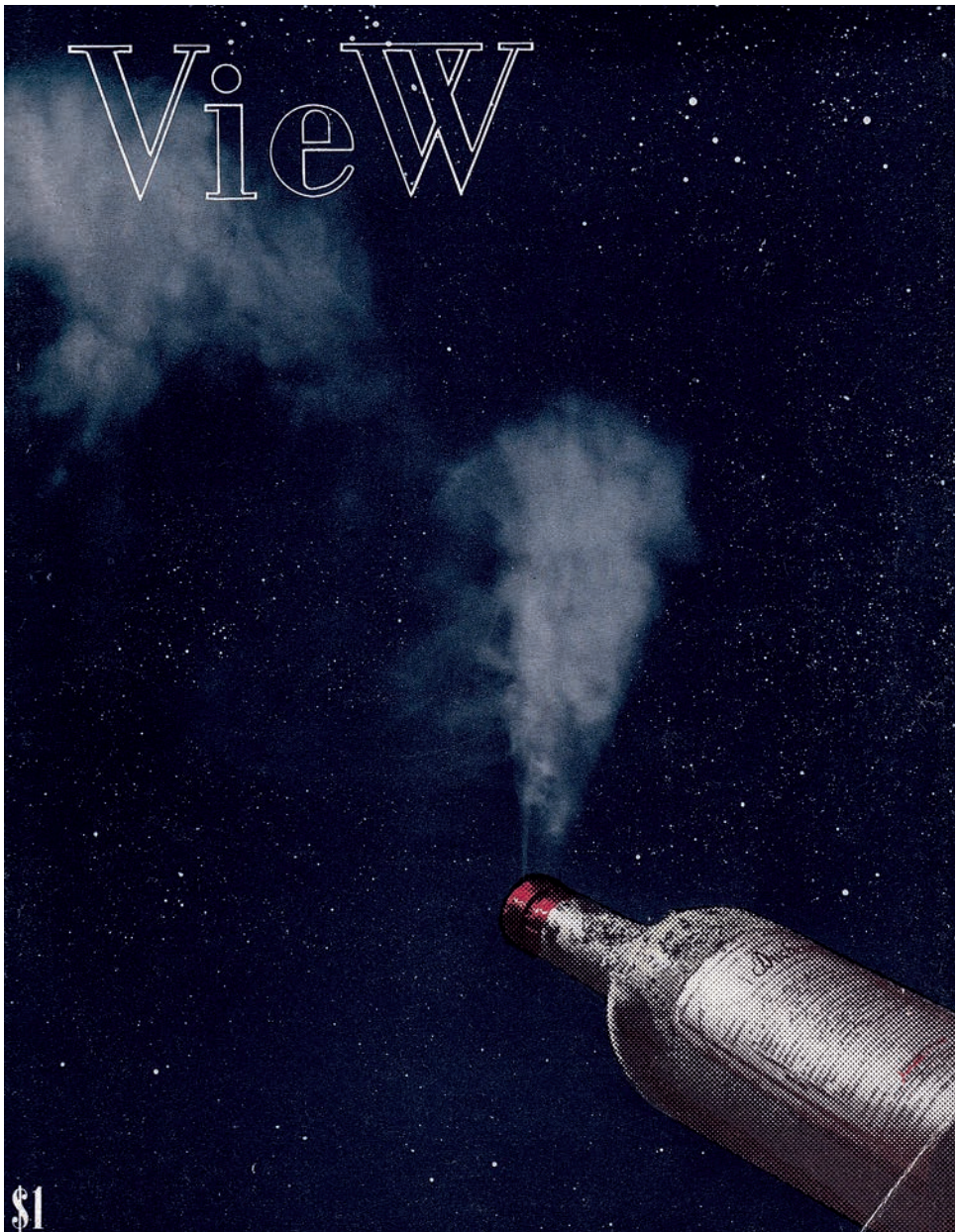


PLATE 1. Marcel Duchamp, front cover, "Marcel Duchamp Number," special issue, *View* 5, no. 1, March 1945. Private collection. 12 x 9¹/₁₆ in. (30.5 x 23 cm.). © 2015 Artists Rights Society (ARS), New York/Société des auteurs dans les arts graphiques et plastiques (ADAGP), Paris/Estate of Marcel Duchamp.



**4^{EME} EXPOSITION DE LA
LOCOMOTION AERIENNE**
26 OCT. — 10 NOV.
GRAND PALAIS CHAMPS-ELYSEES

PLATE 2. Georges Dorival, poster advertising the fourth Exposition de la locomotion aérienne, Paris, October 26–November 10, 1912. Color lithograph, 45 $\frac{7}{8}$ x 61 $\frac{1}{2}$ in. (116.6 x 155.6 cm). Collections of the Bibliothèque nationale de France, Paris. © 2015 Artists Rights Society (ARS), New York/ADAGP, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.



PLATE 3. Marcel Duchamp, Notes, from *La mariée mise à nu par ses célibataires, même* (*The Bride Stripped Bare by Her Bachelors, Even*)—*The Green Box*, 1934 (mixed media).
© 2015 Artists Rights Society (ARS), New York/ADAGP, Paris/Estate of Marcel Duchamp.
Photo credit: Philadelphia Museum of Art/The Louise and Walter Arensberg Collection, 1950/Bridgeman Images.



PLATE 4. Unidentified artist, undated pencil sketch of geometric forms or an early aircraft (monoplane) over the map “Grandes lignes françaises de navigation” (Great French navigation lines), in Pierre Foncin, *Géographie de la France*, 27th ed. (Paris: Armand Colin, 1895), 81. Archives Succession Marcel Duchamp, France.



PLATE 5. Postcard, Reims, “Grande semaine d’aviation de Champagne, journée du 27 août” (Aviation week in Champagne, France, August 27, 1909). Collection of the author.



PLATE 6. Marcel Duchamp, *Three Standard Stoppages*, Paris, 1913–14. Wood box 11 $\frac{1}{8}$ x 50 $\frac{7}{8}$ x 9 in. (28.2 x 129.2 x 22.7 cm), with three threads 39 $\frac{3}{8}$ in. (100 cm), glued to three painted canvas strips 5 $\frac{1}{4}$ x 47 $\frac{1}{4}$ in. (13.3 x 120 cm), each mounted on a glass panel 7 $\frac{1}{4}$ x 49 $\frac{3}{8}$ x $\frac{1}{4}$ in. (18.4 x 125.4 x 0.6 cm), three wood slats 2 $\frac{1}{2}$ x 43 x $\frac{1}{8}$ in. (6.2 x 109.2 x 0.2 cm), shaped along one edge to match the curves of the threads. Katherine S. Dreier Bequest, Museum of Modern Art, New York. © 2015 Artists Rights Society (ARS), New York/ADAGP, Paris/Estate of Marcel Duchamp. Photo: digital image © Museum of Modern Art/Licensed by SCALA/Art Resource, NY.



Paris la nuit.

La publicité lumineuse destinée aux aéronautes donne au panorama de Paris, la nuit, un aspect très particulier.

575

PLATE 7. Albert Guillaume, interior page from "A nous l'espace" (Space is the place) special issue, *L'Assiette au Beurre* 37 (December 14, 1901). 9½ x 12¼ in. (24.2 x 31 cm). Collection of the author. © 2015 Artists Rights Society (ARS), New York.



PLATE 8. Marcel Duchamp, *La mariée mise à nu par ses célibataires, même* (*The Bride Stripped Bare by Her Bachelors, Even*) — *The Green Box*, 1934 (mixed media). Private collection. © 2015 Artists Rights Society (ARS), New York/ADAGP, Paris/Estate of Marcel Duchamp. Photo © Boltin Picture Library/Bridgeman Images.

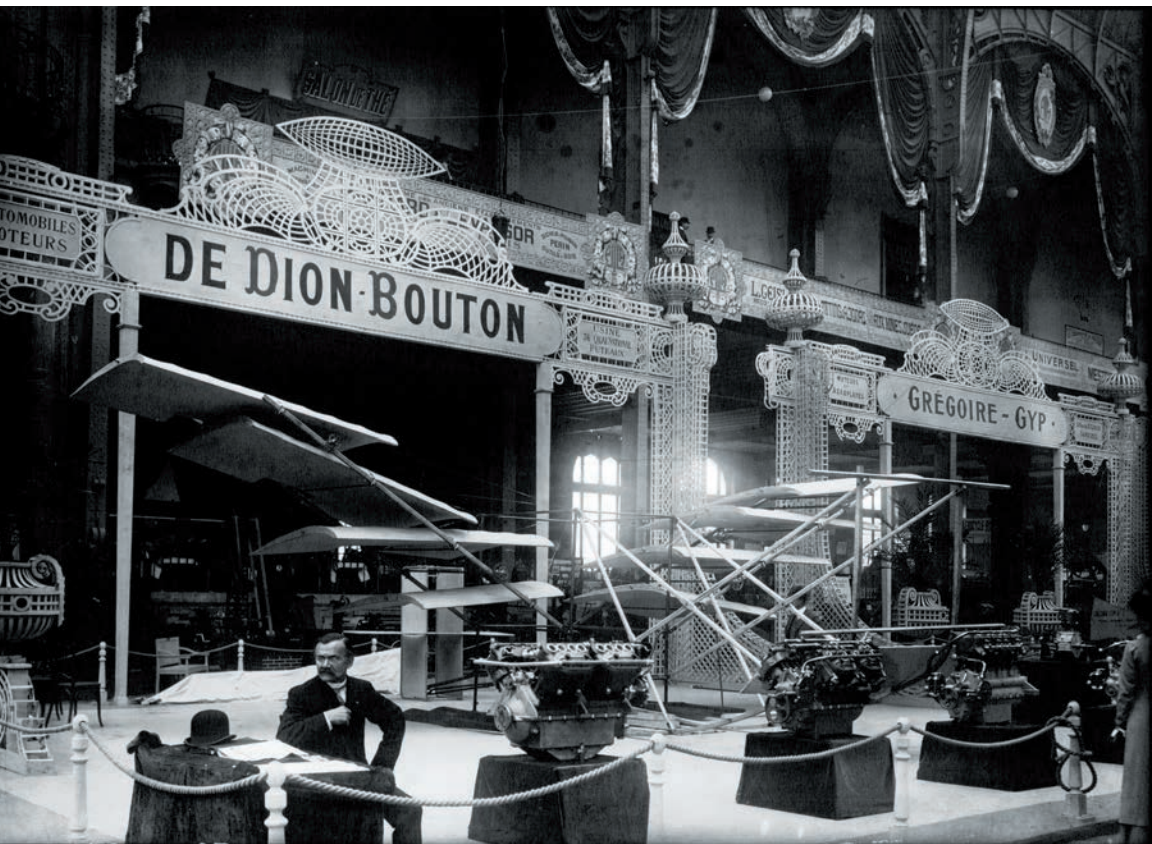


PLATE 9. Exposition de la locomotion aérienne, 1909, De Dion-Bouton stand, exhibiting engines (foreground) and a ten-wing airplane. Misidentified as the “de Weiss” stand by the Bibliothèque nationale de France. Press photograph, Agence Meurisse. Modern digital scan from a glass negative, $5\frac{1}{8} \times 7\frac{3}{32}$ in. (13 x 18 cm). Collections of the Bibliothèque nationale de France, Paris. Photo credit: Département de la reproduction, Bibliothèque nationale de France.

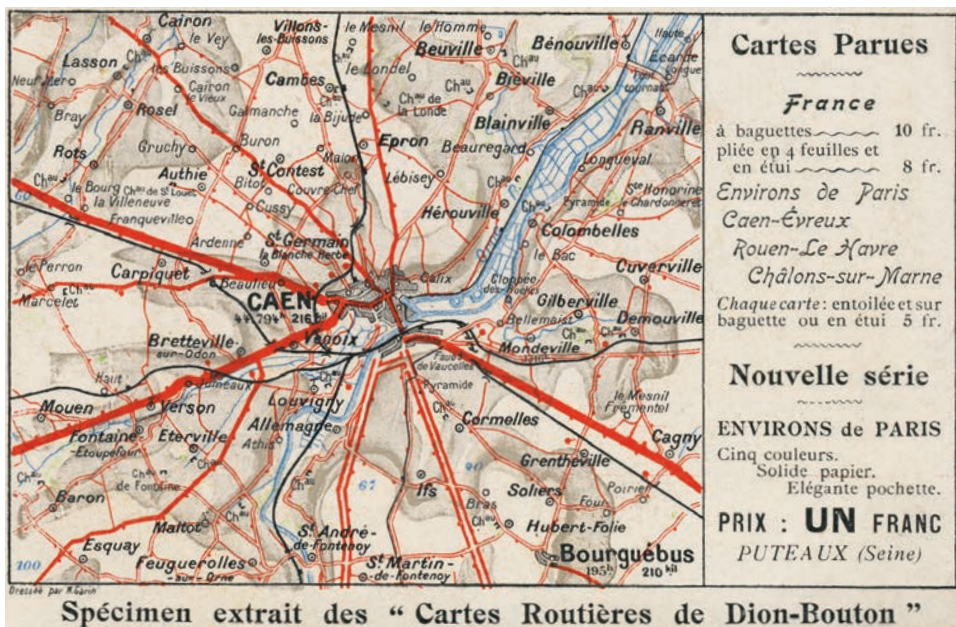


PLATE 10. "Specimen extrait des 'Cartes Routières de Dion-Bouton,'" map on postcard, ca. 1900. Collection of the author.

LA DE DION-BOUTON

ROULE TOUTE SEULE



PLATE 11. Unidentified artist, De Dion-Bouton advertisement postcard, ca. 1900.
Collection of the author.



PLATE 12. Georges Hautot, "Notre avenir est dans l'air: Aéro-cible Michelin" (Our future is in the air: aerial bombing competition by Michelin), postcard, 1912. Produced by Michelin for promotional distribution at the fourth Exposition de la locomotion aérienne, 1912. Collection of the author.

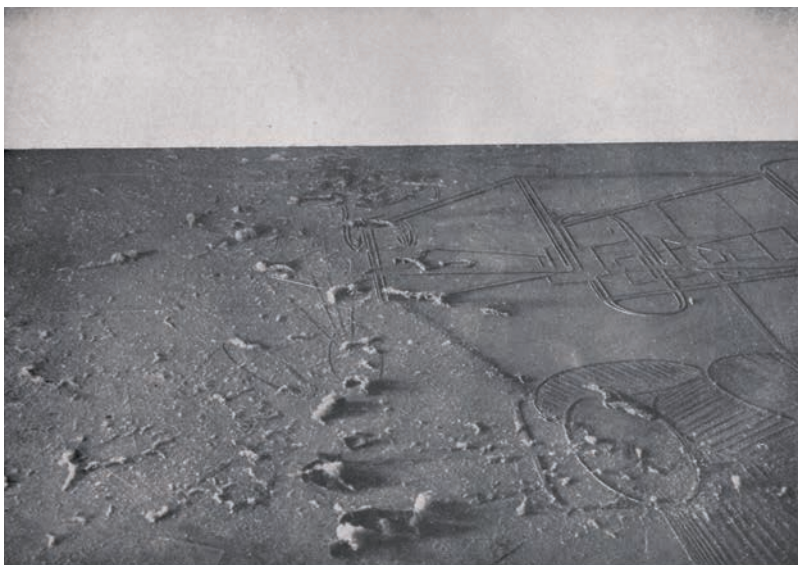



PLATE 13. Marcel Duchamp and Man Ray, photograph by Man Ray of Marcel Duchamp's *Elevage de poussière* (*Dust Breeding*), 1920, as it appeared in the publication *Littérature* (new series), 5 (October 1922). Courtesy of the collection of the International Dada Archive, Special Collections, University of Iowa Libraries. © Man Ray Trust/© 2015 Artists Rights Society (ARS), New York/ADAGP, Paris/Estate of Marcel Duchamp.



PLATE 14. Man Ray, *Trans atlantique*, 1921. Mixed media (photograph, map, pen, and paint on board), 11½ x 9¾ in. (29.3 x 23.7 cm). The Bluff Collection. © Man Ray Trust/ Artists Rights Society (ARS), New York/ ADAGP, Paris, 2015.

DRAMATIC MIRROR

E. K. LINCOLN



Typifying Young America in the performance of America's duty in the struggle for Democracy—chosen for his exceptional ability and brilliant portrayal of

The American Boy.

THAT she was alive he felt sure. Why had he not heard from her? Where was she?

The French weapon of a Saitan Han—had blinded him. He had fought bravely, recklessly—admirably treated to "Kerry Doc"—and yet, with the loss of his sight came a sickening sense of utter helplessness and an overwhelming craving to feel the rapid beating of her heart against his own—the memory of her passionate kisses rekindled anew the fire in his cheeks.


She—his Thérèse, a German spy. Impassable! But the photograph—the Princess, what of her? He could not understand.

How he ultimately won glory and happiness is told in—

(Under the Auspices of the French Government)

June 29, 1918

DOLORES CASSINELLI



Her unusual talent, her piquant charm and her extreme femininity are admirably adapted to the portrayal of the role of—

The Woman of Mystery.


AS if the earth had swallowed her, Thérèse Vermont had disappeared. And then came the Princess—her brilliant converse, her distinguished comport and lavish extravagance.

She had lived but a score of years and in some respects she was still a child—her eyes were unshowered and bling. That she was beautiful to one-doubtful, not could they fathom the mystery of the veil.

She too lived—but country called, and no sacrifice was too great in the performance of Duty.

The law of compensation again proved itself—how she fulfilled her mission and won her right to love and happiness is told in—

(Under the Auspices of the French Government)



1457 B'way **PERRET** New York City
PRODUCTIONS

PLATE 15. Advertisement for the Léonce Perret film *Lafayette, We Come*, 1918. *Dramatic Mirror*, June 29, 1918.



PLATE 16. Postcard showing the Paris planetarium constructed for the scientific attractions area of the Exposition internationale des arts et techniques dans la vie moderne, Cours Albert-Premier, Paris, 1937.



PLATE 17. Paul O'Doyé, photograph of the grand staircase to the astronomy section, Palais de la découverte, 1937. Fernand Léger's painting *Le transport des forces* (*Power Transmission*, 1937), partially visible on the ground floor to the left, was commissioned for the palais as part of its efforts to integrate art and science. Photo credit: © Palais de la découverte; P. O'Doyé.



PLATE 18. Charles Gamain's "Stellarium" or "Interstellar Rocket," constructed for the scientific attractions area of the Exposition internationale des arts et techniques dans la vie moderne, Cours Albert-Premier, Paris, 1937. *Je Sais Tout*, May 1937. Collection of the author.



PLATE 19. Marcel Duchamp, limited edition print made to accompany the exhibition *Ready-Mades et éditions de et sur Marcel Duchamp*, at the Galerie Claude Givaudan, Paris, June 8 to September 30, 1967. Color lithograph. $27\frac{3}{8} \times 18\frac{1}{16}$ in. (69.5 x 48 cm). Private collection. © 2015 Artists Rights Society (ARS), New York/ADAGP, Paris/Estate of Marcel Duchamp. Courtesy Francis M. Naumann Fine Art, LLC.



PLATE 20. Marcel Duchamp, design for the catalog *First Papers of Surrealism*, 1942, showing open catalog and constellation pattern formed by light passing through die-cut holes in the catalog's cover. Special Collections, University of California Library, Davis.
© 2015 Artists Rights Society (ARS), New York/ADAGP, Paris/Estate of Marcel Duchamp.

CHAPTER FOUR

FROM MARCEL TO RROSE

Starry Messengers and Astral Identities

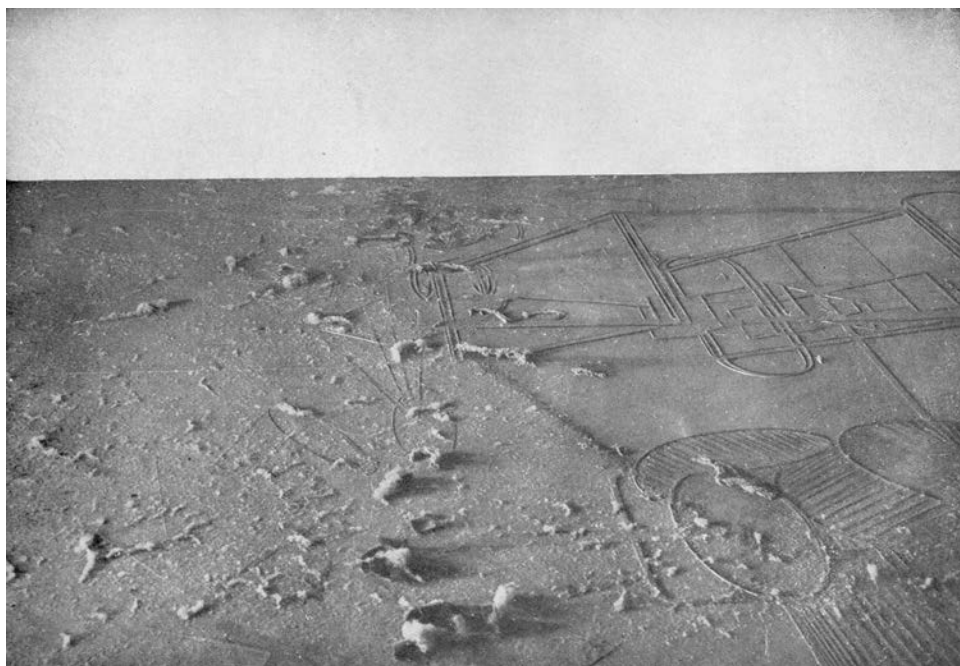
••••• arcel Duchamp's readymades played freely with notions of mobility and scale. Mass-produced objects, the readymades toyed with notions of intellectual property and authorship while elaborating upon geographic and artistic traditions of landscape representation. In the late summer and early autumn of 1921, Duchamp appeared on the streets of Paris sporting a distinct haircut. His comet-shaped coiffure simultaneously engaged contemporary movements in fashion, brand identification, art, and astronomy. By casting himself as a comet, an "indifferent star," he physically embodied the aesthetics of indifference that became central to his career. With the comet haircut, and the creation of his female alter ego, Rose Sélavy, in that same year, Duchamp engaged astronomy in ways that were scientific and poetic, serious and absurd. As Rose and as a shaven-headed Marcel, Duchamp used his body as an artistic medium to comment critically on contemporary art and entertainment. Inspired by a celestial event, the tonsured Duchamp physically "became" a star on the streets of Paris. Rose, inspired by the "stars" of stage and screen, adopted the identity of a star in a metaphorical sense. This chapter emphasizes the importance of Duchamp's collaborations with Man Ray for works of the 1920s, analyzing cartographic elements and references to aviation in their work. To analyze Duchamp's engagement with the stars, I consider his role in a little-known motion picture and his personal engagements with film actors and actresses as metaphorical instances of the "stars" he embodied with his *Tonsure* and the persona of Rose Sélavy.

Duchamp and Man Ray: Creative Collaboration, with a Cartographic Twist

Duchamp's works of the 1920s bear the strong imprint of collaboration with Man Ray. A creative collaboration between the two artists strengthened during this decade as they worked together experimenting with film and still photography. The two maintained their friendship across the full sweep of their lives, from the time they met in the Arensberg circles until late in life. Man Ray shared Duchamp's interest in astronomy and geography. He would have brought special expertise to discussions of geography: in the years before he embarked on his career as a painter, he earned his living making maps and atlases for a cartographic firm.¹ Art historian Mason Klein has noted, about Man Ray, that "as much as he was a dreamer, he was also a pragmatist who would use the material at hand, just as he took advantage of the vocational experiences acquired as a young man working as an engraver, doing layout work in an advertising office, and serving as a draftsman for a cartography company."² A geographic sensibility distinguished Duchamp's collaborations with Man Ray across the decade of the 1920s.

Dust Breeding, also known as *Elevage de poussière* (figure 4.1, plate 13), began when Duchamp stored a large unsealed element of *The Large Glass* uncovered beneath a bed in his New York studio. This portion of *The Large Glass* was the lower half of the work, the "zone of the bachelors." In leaving the unguarded glass, Duchamp may have been consciously following Leonardo da Vinci's ruminations on the possibility of turning dust into an artistic material that might even create its own landscapes.³ After Duchamp had allowed dust to collect on its surface for a prolonged period, Man Ray set upon the task of photographing it. He left open his camera aperture to achieve an hour-long exposure using controlled artificial light. By positioning the camera close to the glass, he gave a strange tilted quality to the resulting photograph that, especially in the cropped variants, depict Duchamp's dusty work with "the strange effect of an aerial view of a desertscape."⁴

An uncropped variant of this image has been reproduced less frequently than the better-known cropped version. Where the uncropped photo shows a white region that appears beyond the edge of the glass, the impression of a horizon line becomes pronounced and the association with landscape imagery is reinforced strongly. When the photograph later appeared in the Dada-controlled serial *Littérature*, it was reproduced under the title *Elevage de poussière* and an accompanying legend that read, "Here is the domain of



4.1. Marcel Duchamp and Man Ray, photograph by Man Ray of Marcel Duchamp's *Elevage de poussière (Dust Breeding)*, 1920, as it appeared in the publication *Littérature* (new series), 5 (October 1922). Courtesy of the collection of the International Dada Archive, Special Collections, University of Iowa Libraries. © Man Ray Trust / © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp.

Rose Sélavy / how arid it is—how fertile it is / how joyous it is—how sad it is.”⁵ Organizing the words on the page of the Dada-supporting literary magazine in this way creates an apparent poetry of contradictions. How can there be a landscape that is simultaneously joyous and sad, arid and fertile?

Although describing the “domaine” or the estates of Rose as both arid *and* fertile might initially appear contradictory, a substantial French geographic discourse had by this time long contended that desert “wastelands” could be turned into productive agricultural territory; all that was needed was to water the arid lands to make them productive.⁶ This was especially prominent in the French colonial efforts to bring the Sahara desert to bloom through extensive irrigation projects. French North Africa could be restored to its former state of agricultural productivity, that of the legendary “Granary of Rome.” Countless colonial estates or *domaines* across North Africa continued to bring this dream to life in Duchamp’s era with their vineyards,

orchards, and fields. Seen through this lens, the photograph of *Elevage de poussière* becomes a view of a desert landscape awaiting regeneration. With the pronunciation of the name of Rose as “arroser la vie,” or “water life,” the arid landscape of *Dust Breeding* is watered and brought to fertility. In the year preceding the publication of *Dust Breeding* in *Littérature*, continental France had experienced dramatically variable weather including drought; 1921 was the period of greatest heat and *sécheresse* for France since official meteorological records had begun in 1851.⁷ *Dust Breeding* was timely.

“The photograph *Elevage de poussière* all but resembles traces of a lost civilization spotted from an airplane,” noted the gallerists Harriet and Sidney Janis in their essay for the special Duchamp number of *View* magazine that appeared in March 1945.⁸ With this phrase the Janises referred to traditions of aerial reconnaissance that would have been fresh in the minds of wartime audiences. Projects employing global aerial photographic surveys to promote cartographic accuracy had been discussed by geography organizations worldwide since the late nineteenth century. Through photographic aerial surveys, archaeologists periodically identified relict traces of past civilizations such as burial mounds, plow lines, walls, and channel lines. These documents appeared frequently during the early years of the twentieth century in popular as well as professional journals; such photos were especially common in the illustrated news media represented in France by *L'Illustration*, among others. With the growing significance of military aerial reconnaissance during World War I, popular understanding of aerial surveys grew exponentially. Audiences reading *View* when it first appeared in the final year of World War II would have had countless opportunities to consider the visual culture of aerial reconnaissance. *Dust Breeding* was confirmed as a landscape. It could be considered an unearthly landscape akin to the well-documented surface of the moon, the “canals” mapped on Mars, or the dreamed-about surfaces of distant planets.⁹ Man Ray’s experience as a mapmaker in the years before he met Duchamp may have played into their collaborative transformation of *Dust Breeding* into a landscape of chance.

Man Ray, Cartography, and Laussedat’s Metrophotography

Cartographic emphases reappeared at various points in Man Ray’s career. “Everyone will tell you I am not a photographer. . . . It’s true. . . . My works are pure metrophotography,” Man Ray noted in an autobiographical state-

ment, “What I Am.”¹⁰ “Metrophotography,” a term from the intertwined histories of modern photography and cartography, was coined by the scientist and military engineer Colonel Aimé Laussedat (1819–1907) to describe a technique for making maps from photographs. Laussedat adapted the term from Greek linguistic roots; “following its etymology, ‘metrophotography’ is the art of taking measurement with the aid of photography,” he explained.¹¹ He developed and employed metrophotography as a tool for surveying land and monuments. In a related invention, Laussedat combined the photographic camera with the theodolite, a surveyor’s tool for measuring horizontal and vertical angles. In addition to his military post, he taught cartography at the Ecole polytechnique, served as a member of the Bureau des longitudes, and was elected to the French Academy of Sciences. Laussedat led the Conservatoire national des arts et métiers as director from 1884 to 1900. Under his leadership, the museum’s collection of materials relative to the histories of cartography and photography grew exponentially. Laussedat was président d’honneur of the Société française de photographie from 1903 to 1905.¹²

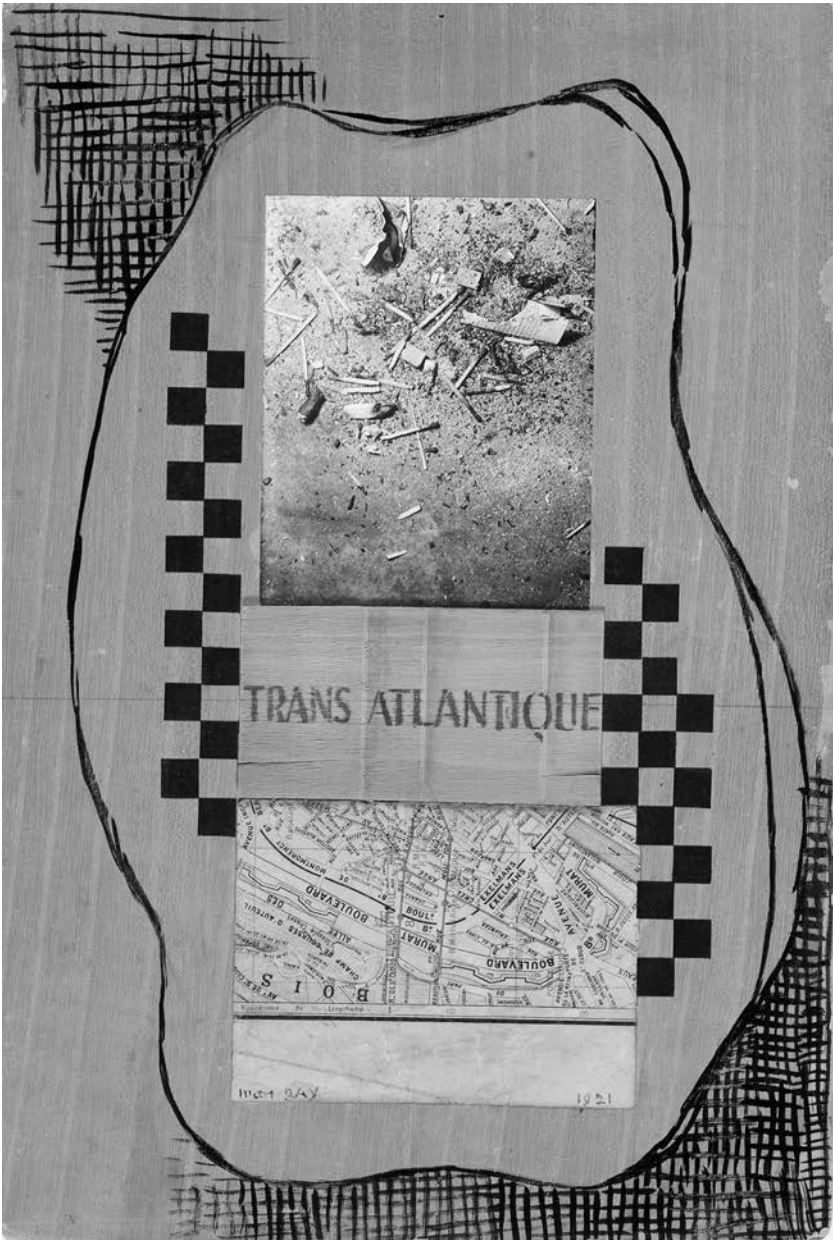
Laussedat’s term “metrophotography” fell out of use in the early twentieth century, when it was replaced by “photogrammetry.” Man Ray took advantage of the arcane status of metrophotography to insert the word into an elaborate game. More an act of appropriation than autobiography, his “autobiographical” statement was borrowed from composer Erik Satie’s fragmentary “Memoirs of an Amnesic [*sic*],” with its opening passage titled “What I Am.” Replacing Satie’s references to music with his own references to photography, Man Ray produced a verbal equivalent of a Duchampian rectified readymade in “What I Am.” Man Ray’s reference to metrophotography gave a cartographic resonance to his term “rayograms,” an autobiographical transformation of “photogram.” In this cartographic sense, the rayograms become map-like creations, a landscape of things in the artist’s darkroom studio that offer a scale of 1:1 reference through their photographic reproduction.¹³ Retracing the Greek etymology of “metrophotography,” art historian Barbara Zabel has connected Man Ray’s statement with his works about measurement and time, including the famous assemblage *Object to Be Destroyed*. “While evoking precisely gauged intervals of time, these works also perform radical subversions of Taylorist efficiency,” Zabel has noted.¹⁴ Despite the intelligence of Zabel’s remarks, they miss the larger references to metrology and cartography necessarily associated with metrophotography.

New Landscapes, Aerial Vision:
Aviation, Trans atlantique, and Dust Breeding

Man Ray's mixed-media work of 1921 titled *Trans atlantique* brought together photography and cartography in curious ways (figure 4.2, plate 14).¹⁵ A collage on board of intimate scale, easily held in a viewer's hands, *Trans atlantique* incorporated paint, found paper, and photography around the title words collaged near the center of the panel. Above the lettering, Man Ray incorporated his photograph *New York 1920*, documenting an accumulation of cigarette butts, burnt matchsticks, and papers torn or crumpled.¹⁶ Below the lettering, a portion extracted from a map of Paris shows a section of the sixteenth arrondissement of the city, including a stretch of the river Seine near the Porte de Saint-Cloud, the edge of the Bois de Boulogne park, and the Hippodrome d'Auteuil horse-racing track.¹⁷

On either side of the lettering "TRANS ATLANTIQUE" appears a running pattern of black squares alternating with equally sized gaps through which the grain of the wood panel appears. Much commentary has related this pattern to a chess board, referring to the love of chess shared by Man Ray and Duchamp as well as to their mutual appreciation for an art rooted in games or play. These arguments are convincing and germane to the interpretation of Man Ray's complex image. A viewer who imagined the patterns' continuation beneath the other collaged elements could, perhaps, anticipate that the patterns might thus form two overlapping chessboards. Yet these physical patterns do not form a single chessboard. This grid adds pattern to the image playfully, simultaneously achieving utilitarian goals. The consistent repetition of equal black and white squares in the "check-board" patterns makes them useful for measurement in the way that a map's grid or its reference to scale are used. Beneath the Paris map, the pattern extends to twelve squares while its New York partner extends to fourteen. Applying the grid confirms that the printed papers representing the two capitals on either side of the Atlantic, "New York" and "Paris," are of equivalent size, though rotated ninety degrees to assume standard "portrait" and "landscape" display conventions. Using the grid to measure and extend the Paris landscape where it is invisible, under the collaged letters of the title, points to other ways to understand this as a work of art about transatlantic artistic exchange.

What is absent or concealed in Man Ray's work reveals much about transatlantic cultural exchange in 1921. Using the grid supplied on the



4.2. Man Ray, *Trans atlantique*, 1921. Mixed media (photograph, map, pen, and paint on board), 11½ x 9⅝ in. (29.3 x 23.7 cm). The Bluff Collection. © Man Ray Trust / Artists Rights Society (ARS), New York / ADAGP, Paris, 2015.

work, a viewer can mentally complete the map as if it extended beneath the words *Trans atlantique* on the collaged surface. The zone of the map beneath the words would include a tiny island in the Seine, the Île aux Cygnes. There, a replica of Frédéric Auguste Bartholdi's *Liberty Enlightening the World* was erected in the year 1889. The reduced-scale *Liberty* on the Île aux Cygnes was a gift from the people of the United States commemorating the centennial of the French Revolution and reciprocating the French gift of Bartholdi's colossal original. Near the Île aux Cygnes stands the bridge made famous by Guillaume Apollinaire's poem "Le Pont Mirabeau," crossing the Seine. Beyond Duchamp's friendship with the poet, his significance can be seen as a transatlantic "bridge" unifying the international avant-garde for whom his free verse served as a rallying cry of modernity.¹⁸ In this sense, the Mirabeau Bridge, with its links to the poem "Le Pont Mirabeau," functioned as a locational indicator for the cultural geographies of the contemporary avant-garde.

Trans atlantique connects to the physical geography of international travel. Its title has commonly been linked to the most prevalent mode of intercontinental travel around 1920, "transatlantique" voyages on ocean-going vessels. The term "transatlantic" was associated with intercontinental communications after a telegraph cable linking Ireland with Newfoundland was activated on August 16, 1858. In the twentieth century, the term "transatlantic" became popular through an early form of brand extrapolation. It was associated with the cargo-and-passenger-carrying steamships of the French Compagnie générale transatlantique (CGT), also known as the Cie. générale transatlantique, or simply the "French Line," renowned for providing stylish travel. Among its *paqueboats*, the SS *France* (first launched in 1912) was well known for its Baroque revival decoration, referred to as a "Versailles of the waters." Later, the SS *Île-de-France* (1927) would achieve recognition as the first cruise ship decorated fully in the Art Deco style that had been showcased at the 1925 Paris Exposition internationale des arts décoratifs et industriels modernes. Does Man Ray's title refer to ocean travel, or air?

Perhaps because early transatlantic flights have been overshadowed by the celebrity of Charles Lindbergh and his 1927 solo flight from New York to Paris, Man Ray's *Trans atlantique* has not generally been associated with aviation. A reference to the dream of transatlantic air travel would have been extremely potent for Duchamp and Man Ray, and would have added a forward-looking aspect to the work's title. References to transatlantic flight

proliferated in the decade preceding Man Ray's departure from New York for Paris and the subsequent creation of this work. To gauge the currency of the term, consider that *The Bibliography of Aeronautics 1909-1916* listed four pages of articles written during that period by authors worldwide contemplating transatlantic travel by plane or dirigible. American military pilot Albert C. Read completed the first transatlantic air crossing from New York when his craft arrived in Plymouth, UK, on May 30, 1919. Read stopped repeatedly along the route, for fueling and other reasons, taking twenty-four days to complete the journey.¹⁹ Although worthy of the title of the first transatlantic flight, and justly celebrated at the time, Read's accomplishment was soon displaced by the speedier crossings others achieved.

Read's transatlantic crossing was not rapid enough to win the most desired cash award in aviation at the time. In April 1913, London's newspaper the *Daily Mail* had announced a cash prize of ten thousand pounds sterling to be awarded to the first aviator to cross the Atlantic between North America and the British Isles in seventy-two consecutive hours or less. Although temporarily suspended during World War I, the competition was reopened following the announcement of the Armistice in 1918. Aviators John William "Jack" Alcock and Arthur Whitten Brown successfully crossed the Atlantic in a lightly modified war-era Vickers Vimy biplane on June 14-15, 1919. Having thus achieved the first transatlantic flight, they were treated as heroes.²⁰ In addition to being awarded the London *Daily Mail* cash prize (given by Winston Churchill, in his official capacity as secretary of state of the UK), they were knighted by King George V at Windsor Palace. Alcock and Brown's names and photographs appeared on front-page headlines of newspapers worldwide. Their Vickers Vimy biplane was received by the Science Museum at South Kensington, London, as a gift to the English nation, where it opened the museum's new aeronautics section when displayed there on December 15, 1919.²¹ Alcock and Brown had opened the proverbial floodgates, and reports of transatlantic air travel filled newspapers. By 1921, transatlantic travel still posed challenges, but its novelty had worn off.

For the collaged map in *Trans atlantique*, Man Ray selected a Parisian neighborhood long associated with aviation. In recognition of the significant association between aviation and this corner of the sixteenth arrondissement, one of the roads along the river Seine depicted in the collaged map was renamed "Quai Louis Blériot," honoring the Frenchman who was the first to successfully pilot a self-propelled plane across the English Channel. During the early years of the twentieth century when this *quartier* was still

being built, this corner was the center of a nascent French aviation industry. Clément Ader may have been the first to bring the experimental industry to this residential neighborhood. As the first Frenchman to accomplish self-propelled flight, Ader remains significant in the annals of aviation. In May 1892, Ader established a large workshop on the rue Jasmin, off of Avenue Mozart, after securing from the French government the “first military research and development contract ever awarded” (in the words of aviation historian Richard Hallion).²² In this location Ader completed pioneering aviation research that culminated in a series of aircraft designs, notably his *Avion III*, commonly known as “the Bat” (la “Chauve-souris”; 1894–97). Characterized by a wooden frame modeled on the skeleton of a bat, with silk for wings, Ader’s vehicle was powered by a steam engine.²³ Arguably more successful as a sculptural marvel than a flying craft, Ader’s *Avion III* made its home in the Conservatoire national des arts et métiers soon after he donated it to the nation in 1902.²⁴

Although Ader abandoned aviation after 1902, the neighborhood soon welcomed an equally famous engineer and aviation pioneer, Gustave Eiffel. Linda Henderson has demonstrated a range of Eiffel’s activities that related to Duchamp’s notes and *The Large Glass*, including the aerodynamics testing that he launched at the tower itself and later expanded into the region of the map collaged into Man Ray’s *Trans atlantique*. Wind preoccupied Eiffel during the design and construction of his landmark tower for the 1889 Exposition universelle in Paris.²⁵ Eiffel in 1909 built a modest laboratory on the Champ de Mars, powered by the tower’s own electric station. There, Eiffel conducted pioneering aerodynamics research on the profiles of airplane wings used by the Wright brothers and other stars of early aviation. Subsequently, Eiffel expanded his testing to include propellers and scale models of full aircraft.²⁶ Efforts to sell the Eiffel Tower as scrap metal were held at bay, in part, by the highly publicized scientific experiments Eiffel conducted at the tower. In 1911, still recovering from damages inflicted by the great flood of early 1910, Eiffel moved his labs to Auteuil. There, in the sixteenth arrondissement, he designed and built a specialized architecture to support his scientific experiments at 67, rue Boileau. His new laboratory included a wind tunnel, or *soufflerie*, two meters in diameter whose fans could achieve wind speeds of thirty meters per second. Eiffel’s wind-tunnel designs set essential standards for aerodynamic research. Other wind tunnels subsequently built (in France, Holland, Japan, and the United States) followed the principles of the Eiffel-type wind tunnel, although they increased the

diameter and speed of the wind stream so that full-sized aircraft might be tested. Reports in the popular press reproduced Eiffel's model airplanes and the innovative design of the wind tunnel itself, making his activities relatively well known in the years before and during World War I. Man Ray, Duchamp, and other passersby who happened upon the building on rue Boileau could read the elegant metal lettering on the building's exterior, proclaiming this to be the site of the "Laboratoire Aérodynamique Eiffel, fondé en 1909."²⁷

Given the contemporary interest in transatlantic flights and the fascination with aerial photography Man Ray and Duchamp shared, the photographs *New York 1920* and *Dust Breeding* merit interpretation as being in dialogue with the burgeoning visual culture of aerial photography. Seen in this light, the dark area in the lower third of *New York 1920* takes on the appearance of an uninhabited zone, such as unbuilt landscape or water. The chessboard pattern of *Trans atlantique* aligns it with the Cartesian grid of vertical and horizontal coordinates by which one reads maps and aerial photographs alike. *Trans atlantique*, *New York 1920*, and *Dust Breeding* together form a nexus for the two artists' shared fascination with geography, cartography, and aerial views.

Rose Sélavy and a Wounded Soldier: The Artist as Star

Duchamp, speaking on the occasion of his first retrospective exhibition, at the Pasadena Museum of Art, 1963, proclaimed, "I am a regular movie actor. . . . I had absolutely no idea of becoming any Marcel Duchamp at all."²⁸ Actor Duchamp gave rise to a star in the character of Rose. By the time that the collaboratively created *Dust Breeding* appeared in the 1922 Dada magazine *Littérature*, artists in the circles around Duchamp would have recognized Rose as his female alter ego. Her persona as a woman of mystery was brought forth selectively, through occasional verbal utterances "heard" through the medium of print and through appearances "witnessed" only through the medium of photography. These distancing effects of a person known only through mediating representations counterbalanced her incarnation through the physical body of Duchamp himself. That physicality remained at the personal scale, while others' knowledge of Rose was perpetually mediated. Such an approach to establishing her identity was one of many elements that linked the figure of Rose to film stars, known mostly through the films themselves and the equally performative appearances in

news media. Rose, modeled on ideals borrowed from representations of contemporary women, embodied the stars in the sense that “stars” of stage and screen metaphorically rival the stars of the celestial vault.

Posing as Rose Sélavy, in costume before Man Ray’s camera, Duchamp notably transformed his identity through the manipulation or addition of hair and fashion accessories that ranged from hats to furs. Although fur could be fashionable for both men and women in the 1920s, hairstyles and shaving were generally stable elements defining gendered appearances in Europe and the United States at this time. Because of this stability, gender bending could take place with relatively simple modifications to hair and dress, evidenced by the emergence of androgynous styles at various moments in the early twentieth century. With modern times came a professionalization of fashion industries, including that of the hairdresser. Women’s hair fashions were transformed by the emergence of a new styling technique that boosted the hairdresser’s trade in the 1880s, known as the “Marcel wave.”²⁹ Developed by Marcel Grateau, a Frenchman, the Marcel wave was one of the most popular hairstyles of the late nineteenth and early twentieth centuries, remaining fashionable through the 1920s and revived regularly until the emergence of easy technologies to create the “perm” or “permanent waves” in the 1950s.³⁰ When Duchamp arrived in New York in 1915, his first name was on the lips of women at all levels of society who aspired to fashionable hairstyles like the Marcel wave. Thanks to press coverage of the 1913 Armory Show, in which Duchamp’s *Nude Descending a Staircase (No. 2)* (1912) featured prominently, his proper name was laden with celebrity.

In the guise of Rose Sélavy and *Tonsure*, Duchamp manipulated notions of beauty and stardom. Offering a figurative definition of *astre*, the French word for star, *Petit Larousse illustré* (French dictionary) allied the word with exceptional female beauty: “beauté rare: cette femme est un astre.”³¹ This figurative definition is one explanation for the preponderance of woman-star analogies. Late nineteenth-century music halls developed this analogy in the precinematic era, as a way of capitalizing on the idea of rare beauties as stars. In early cinema, this woman-star analogy is further elaborated. For instance, in many films by Georges Méliès, including the well-known *Le voyage dans la lune* (1902), beauties fill the skies. These traditions were firmly ensconced before the “star system” emerged in silent cinema circa 1913–14, to be further established as Hollywood studios claimed centrality in the motion picture industry.³² In addition to beauty, the star system focused on personalities, establishing a cult of celebrity. Duchamp, greeted

as a celebrity upon his arrival in New York, created Rose Sélavy with an aura of celebrity. Rose became known by way of her references in publications and, later, photographs, in ways akin to the proliferation of celebrity through press publicity.³³

Modern concepts of celebrity or “star” status remained in their infancy in the years when motion picture films first appeared. Historian of French culture Michael Garval traces the emergence of “modern celebrity culture” to the career of dancer Cléo de Mérode.³⁴ Mérode achieved international star status in the late nineteenth century, through her canny use of all the varied forms of visual culture available at the time. Her fame grew through stories in the illustrated popular press and imagery reproduced as postcards, comic illustrations, inexpensive photos and prints, and other ephemera. Mérode garnered publicity through stage performances and the controversial display of a statue that depicted her in a state of nudity, Alexandre Falguière’s *La danseuse* (1896). Her success hinged as much on what she concealed (her ears!) as what she revealed. Garval summarizes that Mérode’s “carefully cultivated appearance of high virtue collided with suggestions of shocking licentiousness.”³⁵ Such a collision, fanned by reports that she was the lover of the Belgian King Leopold, produced press coverage, gossip, and an ever-growing popular audience well into the twentieth century. Like many emerging stars of the silent screen, Rose Sélavy was also a product of modern celebrity culture. Trends toward the media construction of stars that had begun in the *fin de siècle* were well ensconced in cinematic circles by the 1920s.


In this light, two seldom-mentioned details from Duchamp’s biography bear consideration. Both relate to cinema. Scholarly considerations of Duchamp and cinema usually emphasize his experimental work in film, such as *Anémic Cinéma* and collaborations with Man Ray. Yet in summer of 1918 Duchamp began giving French lessons to a rising star of the silent screen and acted in a motion picture. Through these experiences Duchamp came to understand the distinct cultures of cinema, including the social world of motion picture directors and stars.

Since arriving in New York in 1915 Duchamp had given occasional French lessons to selected women in New York. These lessons connected him socially and provided a modest income while allowing him great freedom. In early October 1917 he reduced his tutoring commitments to take full-time employment as an assistant to a general in the offices of the French ministry of war in New York.³⁶ He soon took on a new student for his lessons, Jean

DRAMATIC MIRROR

June 29, 1918

E. K. LINCOLN



Typifying Young America in the performance of America's duty in the struggle for Democracy—chosen for his exceptional ability and brilliant portrayal of

The American Boy.

THAT she was alive he felt sure. Why had he not heard from her? Where was she?


The French wispes of a Sataine Hux—had blinded him. He had fought fiercely, bravely—indubitably enabled to "Carry On"—and yet, with the loss of his sight came a sickening sense of utter helplessness and an overwhelming craving to feel the rapid beating of her heart against his own—the urgency of her passionate kisses indicated since the day in his cheeks.

She—his Theres, a German spy. Impossible! But the photograph—the Princess, what of her? He could not understand.

How he ultimately won glory and happiness is told in—

(Under the Auspices of the French Government)

DOLORES CASSINELLI



Her unusual talent, her piquant charm and her extreme femininity are admirably adapted to the portrayal of the role of—

The Woman of Mystery.


AS if the earth had swallowed her, Theres Yarnell had disappeared. And then came the Princess—her brilliant concerts, her distinguished concert and lavish extravagance.

She had lived but a score of years and in some respects she was still a child—her toys were automobiles and kings. That she was beautiful no one doubted, nor could they fathom the mystery of the veil.

She too lived—but country called, and no sacrifice was too great in the performance of Duty.

The law of compensation again proved itself—how she fulfilled her mission and won her right to love and happiness is told in—

(Under the Auspices of the French Government)



1457 B'way **PERRET** New York City
PRODUCTIONS

4.3. Advertisement for the Léonce Perret film *Lafayette, We Come*, 1918. *Dramatic Mirror*, June 29, 1918.

Acker (1893–1978). The biographer Bernard Marcadé suggests that Acker introduced Duchamp into the world of cinema, inviting him to parties that he attended in the company of a young woman from Rouen, recently arrived from France, named Madeleine Turban. Mad, as he called her, had come on a mission to raise funds for the International Red Cross; perhaps they met through his job at the French ministry.

Through these connections with the communities of wartime French expatriates and cinema stars, Duchamp was invited to act in a silent film. A fully Franco-American venture, from its participants to its wartime political message, the film was French director Léonce Perret's *Lafayette, We Come* (1918; figure 4.3, plate 15). The film's title quoted a phrase that promotional materials attributed to U.S. general John Pershing upon his arrival in France in 1917, amidst the war, referring to the American presence in France as a gesture of homage to Lafayette's contributions to the U.S. revolutionary war effort—a sign of Franco-American exchange. "A cheerful patriotic spectacle that will thrill and delight an audience of Americans," advertisements for the film proclaimed.³⁷

On July 8, 1918, Duchamp wrote to his friend Jean Crotti, the Swiss artist with whom he had shared a New York studio not long before. “This evening, I’ve just acted a short scene as a wounded man being tended by a superb nurse in a film by Perret called *Lafayette, We Come*. If, by any chance, the movie gets shown in Paris, go and see it just for my little two-minute scene.”³⁸ Duchamp emphasized the film’s female lead, Dolores Casinelli (1888–1984), playing a Red Cross nurse, and was frank about his limited participation in the movie. *Lafayette, We Come* would have resonated with Duchamp on multiple levels. Its plot, structured around a love story and themes of malleable identities (Casinelli played a French nurse who may be a German princess in disguise), sought to show the war without naming it—and did so by recycling wartime newsreel footage as if it were ready-made cinema.³⁹ Layered upon his reputation as a celebrity in the art world (“the *Nude Descending a Staircase* Man”), and socializing with the local film community circa 1918, the experience of acting in *Lafayette, We Come* gave him new insights into the world of stars and starlets. In addition to his performance as a wounded man in *Lafayette, We Come*, Duchamp appeared in other film projects including *Entr’acte* (director René Clair, 1924); *Witch’s Cradle* (director Maya Deren, 1943–44); *Dreams That Money Can Buy* (director Hans Richter, 1947); and *8 x 8: A Chess Sonata in 8 Movements* (director Hans Richter, 1957). Although the place of cinema across Duchamp’s career has garnered some scholarly attention, Duchamp’s playful engagement with cinematic performance merits further consideration. To what degree was Rose Sélavy conceived as a performance star?

In photographs, Rose Sélavy posed as a star of stage and screen. Her presence owed much to the traditional poses of advertising and studio portrait photography from which she borrowed, especially the tradition of film stills intended to advertise motion pictures and the public personae of the “New Woman.”⁴⁰ Some photographs enhanced the femininity of Rose by complementing Duchamp’s costumed figure with elegant hands that wrap around him to reach toward the face of Rose (figure 4.4). Borrowing a technique from advertisements that featured “hand models” selected for the qualities of their skin and nails, these images also adapt the incline of the chin, and distant glance, that were standard practices for portrait photographers of the day. Edward Steichen, who photographed Duchamp in 1917, was eminently successful in his work for advertisers, the magazine publisher Condé Nast, and individual clients. A visitor to his studio might first have encountered his assistant, Paul W. Hollingshead, for instance.



4.4. Marcel Duchamp, photographed by Man Ray, *Marcel Duchamp as Rose Sélavy*, ca. 1920–21. Gelatin silver print, 8½ x 6¼ in. (21.6 x 17.3 cm). Signed in black ink, at lower right: “lovingly / Rose Sélavy / alias Marcel Duchamp” [cursive]. The Samuel S. White III and Vera White Collection, 1957. © 2015 Artists Rights Society (ARS), New York/ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: Philadelphia Museum of Art / Art Resource, NY.

Hollingshead would post the sitter, “set up the shot,” and then call for Steichen to enter the room and snap the photograph. Such practices could flourish because the Steichen studio could depend upon its standard techniques for posing models.⁴¹ A glimpse through fashion or film magazines from the era makes obvious the range of standard poses engaged in promoting products or people. Duchamp inserted Rose into this dialogue.

If there were dependable standards, there could also be surprises—thanks to the magic of motion pictures and to the drama surrounding celebrity that journalism promoted. When Acker the actress introduced Duchamp into her social circles from the film community, Hollywood was not yet the center of U.S. film production (a title to which New Jersey had better claim). Calvin Tomkins reports that Duchamp and Mad joined Acker for a party at the home of Pearl White (1889–1938), who had become a major celebrity after her roles as the female lead in the *Perils of Pauline* (1914) and many other popular serials. Amidst the film crowds the identities of the “American woman” and the “modern girl” that had so intrigued Duchamp since his arrival in New York were represented with at least the same intensity that he saw amongst his Greenwich Village cohort.⁴² Art historian Amelia Jones has highlighted the anxieties surrounding shifting

gender roles in the time of World War I, pointing especially to the Dada artist Baroness Elsa Von Freytag-Loringhoven (1874–1927) and her performance of gender identity. In contrast to the subcultural context through which the baroness was known to her fellow New York Dadaists, Acker's identity as a lesbian became fodder for national-scale public conversation thanks to her film associations. In a highly publicized Hollywood wedding, Acker married silent screen star Rudolf Valentino on November 5, 1919, at a moment when his career had begun to take off. The wedding seems to have been the sort of event for which Hollywood has become known, a photo opportunity. In a much-publicized 1921 trial, Acker sought alimony and then sued Valentino for divorce on the grounds of desertion.⁴³ Photographs of Duchamp's gender transformations into Rose occurred at a moment when the news of his onetime student was regular tabloid news.

The historian of fashion Sarah Berry has argued that female stars of the 1920s played an active, not a passive, role in shaping women's self-presentation. This dynamic played out in her endorsement of consumer goods, personal care products, and fashion, leading to the active development of new roles for women in the public sphere and the workplace.⁴⁴ This conceptual approach to the female persona sheds light on how Duchamp's engagement with the metaphorical stars of cinema and fashion contributed to his vision of Rose as an entrepreneurial alter ego. Duchamp emblazoned his sculpture *Fresh Widow* with glued-down typography indicating the object's title and that it was COPYRIGHT ROSE SELAVY 1920 (figure 4.5). In this early incarnation Duchamp wrote her name with a single *r*, unlike the later versions that doubled the letter to make Rose. Here, before Rose was made visual, her presence was asserted as a holder of intellectual property. With this gesture Duchamp associates the work with the models accompanying applications for commercial brevets (the early French equivalent of copyright registration) that he would have seen at the Musée des arts et métiers. Duchamp's copyright claim asserts an entrepreneurial context akin to those exerted on-screen and through print media by iconic female stars. In *Fresh Widow*, Duchamp's female alter ego asserted her intellectual property.

If the French dominated early twentieth-century fashion, their prominence was contested already by the era of World War I. The art historian Nancy Troy has demonstrated how a sense of national economic competition pitted U.S. and French designers against one another, especially where questions of intellectual property were concerned.⁴⁵ Parisian couturier



4.5. Marcel Duchamp, *Fresh Widow*, New York, 1920. Miniature French window, painted wood frame, and panes of glass covered with black leather, 30½ x 17⅝ in. (77.5 x 44.8 cm), on wood sill ¾ x 21 x 4 in. (1.9 x 53.4 x 10.2 cm). Katherine S. Dreier Bequest, Museum of Modern Art, New York. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp.

Paul Poiret (1879–1944) lobbied for protective legislation that would prevent the fashion industry from piracy, asserting the intellectual property of a couture house and its right to control manufacture, distribution, and sale. Troy aligns the poetic inscriptions and names Duchamp composed for his readymades with the “allusive words and phrases for the titles of their couture models in order to encourage their clients to make poetic associations rather than merely functional or straightforward, commercial connections with the dresses.”⁴⁶ By appointing copyright to Rose for the poetically titled *Fresh Widow*, Duchamp asserted his awareness of larger circumstances surrounding intellectual property, the relation of copies to originals, and the powerful identity of a “star” artist or designer.

Although French women were stereotypically famous for their beauty, which was interpreted as empowering them, a sense of political power was not necessarily associated with French women. France did not grant women voting rights until 1944. Entrepreneurially minded women emerged slowly in French fashion; despite their earlier work, figures such as the

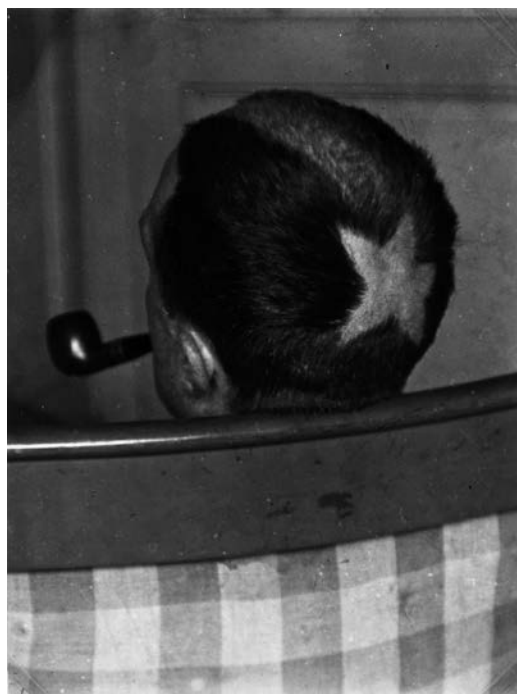
artist-designer Sonia Delaunay and couturiers Madeleine Vionnet and Coco Chanel came into their own as entrepreneurs in the mid-1920s. Later in the 1920s, the trio of women who cofounded the couture house Rose Valois, known for millinery fashions, demonstrated this shift in female power within French fashion while borrowing the “readymade” name Rose with its associations of eroticism and beauty.

Advertisers, entertainers, and others invoked the stars scientifically, metaphorically, and for financial gain. To mark the 1925 Exposition des arts décoratifs, Paris herself was celebrated with garlands of stars wrapped round the Tour Eiffel, their electric glow shining triumphantly to illuminate the darkness of the Paris night.⁴⁷ Designer Maximilien Vox created a keepsake pamphlet/catalog published in 1932 by the Paris department store Galeries Lafayette titled “Ce que disent les étoiles,” or “What the stars say.” Vox’s cover design showed cinema-style klieg lights raking the skies from their position atop Galeries Lafayette. Inside, photographs of contemporary stars of stage and screen were montaged into page layouts featuring the latest fashions for men and women. Each star’s autograph was printed upon her photograph, making the catalog a surrogate for the autograph books then gaining popularity. Audiences were encouraged to read the fashion advice of cinema’s stars whose words, unsurprisingly, reinforced the options advertised within the pamphlet’s pages. The photographic faces of the celebrities, cut out and affixed to the pages’ flat backgrounds, mostly gaze upward as if to hear and channel the voices of the celestial stars above. Through Rose’s photographic self-presentation, Duchamp echoed the vocabulary of celebrity merchandising as it continued to grow from the 1920s into the 1930s.

Starry Messenger, Mysterious Visitor:

Duchamp’s *Tonsure* Revisited

Duchamp’s comet-shaped haircut occupies a curious place in the history of art. Despite its status among works that inspired the development of body art in the 1960s and 1970s, limited scholarship has focused on this ephemeral haircut or “tonsure.”⁴⁸ Scholars have not previously considered the degree to which Duchamp’s haircut related to specific astronomical phenomena observed at the time he cut his hair in this way. In light of evidence confirming the date of the tonsure, Duchamp’s gesture can be seen as a simultaneous engagement with astronomy, fashion, and the avant-



4.6. Marcel Duchamp, photographed by Man Ray, *Tonsure* (rear view), 1921. Gelatin silver print on postcard paper, $4\frac{3}{4} \times 3\frac{1}{2}$ in. (12.1 x 9 cm). Private collection, courtesy of Sean Kelly, New York. © Man Ray Trust / © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp.

garde. Duchamp transformed himself into a work of art and enacted the peregrinations of a comet as he moved through Paris with a shaved head. Duchamp transformed himself into a “starry messenger,” the “mysterious visitor” spotted by astronomers in the evening skies of early August 1921 (figure 4.6).

The phrase “Starry Messenger” is one English translation of the title of Galileo Galilei’s influential *Sidereus Nuncius* (1610). In that book Galileo reported the first scientific observations made with the aid of a telescope. To study and communicate his observations, Galileo made meticulous drawings of what he saw with the naked eye and through the lens of the telescope. His documented findings challenged previous thought about the cosmos. For instance, his drawings revealed the imperfections of the moon and showed that cloudy areas of some nebulae and the Milky Way were clusters of stars too small to be perceived as such without telescopes. Duchamp could have consulted Galileo’s works when he worked at the Bibliothèque Sainte-Geneviève. At a time when he actively sought alternative approaches to traditional art forms, whether 1912 or 1921, Galileo’s “dry” scientific illustrations might have especially appealed to Duchamp.

Documentary evidence now dispels longstanding confusion about the date of Duchamp's comet haircut. Such confusion resulted from the multiple versions of the photograph that he circulated and the problems brought about by dates written on the photos long after the initial image was made. His coiffure became known most notably through the photograph Duchamp chose to include in the first monographic study of his work, Robert Lebel's *Sur Marcel Duchamp* (a variant of figure 4.6).⁴⁹ For Lebel's book Duchamp selected this image of himself, glimpsed from behind, while smoking a pipe and seated in an upholstered chair upon whose checkerboard plaid the sculpted comet appears ready to land. Duchamp assisted Lebel in the preparation and design of the monograph, giving the latter unpublished materials including this photograph that Lebel dated 1921.⁵⁰

Confirmation of the date of the haircut was formerly complicated by other photographs, variations upon the Lebel version with inscriptions in Duchamp's handwriting indicating they were from 1919.⁵¹ Before Lebel's book, only one public appearance of the comet haircut's photographic documentation can be confirmed. Two small photographs of Duchamp, one of which shows the comet haircut, appeared affixed to Francis Picabia's collaborative work titled *L'œil cacodylate* (1921+). For many years after its creation, *L'œil cacodylate*—and thus Duchamp's comet haircut—remained on view at the *Bœuf sur le Toit*, a Parisian brasserie frequented by many avant-garde artists who contributed to Picabia's *L'œil cacodylate*.⁵²

Additional photographs have come to light since the publications by Lebel and Arturo Schwarz, revealing the deliberation with which Duchamp posed repeatedly. His careful documentation of this tonsure, and the deliberation with which he preserved these pictures, give significance to an otherwise ephemeral performance. Comparative analysis of these photographs reveals subtle differences in the haircut that indicate both the passage of time and the likelihood that Duchamp and friends reshaved the haircut to distinct effect. Because of the subtlety of the changes, and of contemporary events surrounding the tonsure, these images likely all relate to the same event over time, rather than a repeated gesture of multiple haircuts.⁵³ Although no known contemporary documents reveal the identity of the friend(s) who assisted Duchamp in shaving his head, Duchamp's comet is frequently attributed to Georges de Zayas.⁵⁴

Art historian James W. McManus has dated the appearance of the haircut to August–September 1921, relying upon two letters written by Georges Ribemont-Dessaignes to Tristan Tzara.⁵⁵ No mention of the comet haircut

appears in the first letter, dated August 9, 1921. The letter of September 17, 1921, however, comments on Duchamp's strange haircut during the second of two recent visits to Ribemont-Dessaignes's home in Les Houveaux, outside Paris. "[I] saw Marcel Duchamp who has been here twice. The last time he had a part of his head shaved in the shape of a five-pointed star followed by a sufficiently wide avenue. To tell you the truth, the effect is useless!"⁵⁶ Questions of utility aside, the tonsure's appearance in August or September 1921 coincided with specific celestial phenomena that garnered international attention.

A Mysterious Celestial Phenomenon of 1921

Writing in *Scientific American*, astronomer Henry Norris Russell referred to the appearance of a "mysterious visitor" at sunset on the evening of Sunday, August 7, 1921, awakening international interest when subsequently reported.⁵⁷ This reference to a "mysterious visitor" might have applied equally to Duchamp's contemporaneous haircut or to "the unidentified celestial object" Russell described, following the observations of a party of amateurs visiting the home of W. W. Campbell, director of the Lick Observatory, near San Jose, California. Campbell's guests that evening included World War I flying aces Captain Eddie V. Rickenbacker and Major Reed Chambers. As the press reported their role in this remarkable celestial sighting, their amateur stargazer status was an aspect repeatedly noted by the press. Subsequent writings confirmed eyewitness sightings of related celestial phenomena around the globe (figure 4.7). Yet the sign in the sky remained mysterious as its appearance was discussed in the press over the ensuing weeks. Was it a newly discovered star, or a new comet?

"Comète ou étoile nouvelle?" This question about the nature of the celestial event opened the September 3, 1921, supplement to *La Nature*, the French magazine of popular science. *La Nature* continued, "A telegram from the Central Bureau [for Astronomical Telegrams] at [the Royal Observatory of] Uccle (Belgium), dated August 8 [1921] has arrived to announce a most curious observation, made on August 7, at night, of a star-like body [*corps d'apparence stellaire*], brighter than Venus, at 30 degrees to the east and at one degree to the south of the Sun."⁵⁸ Referring to this mysterious phenomenon as an "astre énigmatique," *La Nature* related the fruitless scrutiny of the skies on that and subsequent days to find additional traces of the mysterious phenomenon. Borrowing from speculation by the



4.7. Scriven Bolton, “Has the Earth Brushed by a Comet’s Tail? A Celestial Surprise: The Tail of a Mysterious Comet, as Seen End-on from the Königstuhl Observatory on the Night of August 8-9, Apparently Enveloping the Earth,” *Illustrated London News*, September 17, 1921, 371. Photo courtesy of Illustrated London News Ltd.; Mary Evans Picture Library; Imageselect.

international scientific press, *La Nature* entertained possible connections between the California sighting and another at the Königstuhl observatory near Heidelberg, Germany. Königstuhl staff reported that, on the night of August 8-9, “the Earth passed through the tail of a comet. One observed a certain number of luminous bands extending across a clear sky in the form of a garland drawn from the west-north-west to the east-south-east. These bands moved slowly in a north-north-east direction, becoming very faint near daybreak. The comet’s head passed to the south, between the Earth and the Sun. One supposes that this phenomenon, never before observed, was caused by the same body observed August 7 in the United States.”⁵⁹ Because Campbell’s American group observed the phenomenon at forty degrees from the Milky Way, its chances of being a nova (or new star) were slim, *La Nature* concluded, given that most new stars appear within the Milky Way.⁶⁰ Astronomers and amateurs continued to seek the elusive “Lick Star” in the days and week following the initial sightings, as the *Chicago Tribune* and the *New York Times* reported on August 21 in a special dispatch cabled from Paris. “Every night a search has been made for

it [the “Lick Star”] by astronomers all over Europe. So far they have failed completely to find any star, comet or other celestial body which could in any way correspond to the description. Further information is being asked by several French astronomers.”⁶¹ Had the unnamed French astronomers turned their observations to the streets of Paris, they might have sighted the mysterious “comet” there, shaved into the hair of Duchamp.

The *New York Times* reported on October 30, 1921, that the mysterious phenomenon of August 7 had been “definitively identified as a large previously unknown comet by Professor Henry Norris Russell of Princeton.”⁶² Yet, as 1921 ended, astronomers proclaimed the August sighting inconclusive. Because they were unable to determine the precise nature of the phenomenon, it was not included in that year’s annual roster of comet sightings. In a report dated January 3, 1922, the official comet committee concluded that “inasmuch as the object was not subsequently observed, its cometary character cannot be asserted, and the committee does not list it as one of the comets of the year [1921].”⁶³ Duchamp’s haircut was performed during the time when this celestial phenomenon was pursued by astronomers and chronicled by the press. Because the identity of the “Lick Star” remained unconfirmed, its absence on official comet listings would have posed challenges for Duchamp scholars who might have sought to associate the tonsure with specific astronomical events. This errant star was nearly lost from history.

Can the haircut itself be identified definitively as a comet? Or might it be seen as a meteor, a sun, or—more generally—a star? To view the coiffure as an embodiment of celestial phenomena other than a comet broadens the potential meanings of Duchamp’s haircut. To interpret the haircut as a meteor, rather than a comet, opens an especially Romantic reading of Duchamp’s gesture. Proclaiming himself meteoric would have indicated a sudden efflorescence followed by an eventual burning out and disappearance. Such associations would have aligned him with Romantic creators such as the ill-fated poet Thomas Chatterton, whose death from arsenic poisoning at age seventeen cut short a promising literary career. Romantic mythologies like Chatterton’s so appealed to nineteenth-century audiences that a painting of this theme by Henry Wallis was a great success when exhibited at the Royal Academy, eliciting praise from critic John Ruskin and others.⁶⁴ To read the haircut as a meteor playfully confronts Duchamp’s own meteoric rise and fall, as charted by the scandalous success of his *Nude Descending a Staircase* in the Armory Show of 1913 and his abandonment

of painting after 1918. Yet the meteoric interpretation likely has more in common with the revival of a Romantic notion of the artist in popular culture of more recent times, such as rock and roll's cult of youth, than with Duchamp himself.⁶⁵ Duchamp's efforts to distance himself from a heritage of Romanticism complicate such an interpretation, unless his gesture embodied a tongue-in-cheek commentary on the stereotype of the Romantic artist. A Dada-infused sense of humor would have been in keeping with the playful atmosphere promoted by Duchamp and his Parisian cohort in 1921. A performative approach to making art infused Paris Dada, especially in 1921, a markedly fractious and vibrant year.⁶⁶

As an embodied pun, Duchamp's astral hair gave him a means to trump Delacroix, a key predecessor in modern art (and, like Duchamp, a graduate of the Lycée Corneille in Rouen). The coiffure gives a concrete variation on the frequently repeated phrase eulogizing Delacroix "who had the sun in his head."⁶⁷ Given Duchamp's efforts to turn art away from the "retinal" traditions of Delacroix and his followers, the 1921 gesture was an especially Dadaist break with the past. Although Delacroix had died almost sixty years earlier, on August 13, 1863, the painter reappeared in the news repeatedly throughout 1921. In 1921 his *Death of Sardanapalus* (1827) was purchased by the French government and subsequently displayed in Paris at the Louvre Museum, prompting renewed considerations of the painter's impact on modern art. Paul Signac's influential 1899 treatise on color was reissued in 1921, reaffirming Delacroix's position as leader of an avant-garde tradition of modern colorists.⁶⁸ Unlike Delacroix, who "had the sun in his head," Duchamp's starry coiffure was an external feature.

Errant Stars and Indifference

Despite the difference between the sun and a comet, both are examples of an *astre*, the French term referring to celestial bodies and to rare beauties.⁶⁹ Denis Diderot and Jean d'Alembert's encyclopedia (1751-81) standardized definitions of *astre* and *comète*, encapsulating historical and contemporary debates about astronomy and natural sciences in encyclopedic entries. Following their definition, an "*astre* is a general word applied to stars, be they fixed or errant; that is to say, to stars, to planets, and to comets."⁷⁰ Diderot and d'Alembert defined a comet as a "celestial body of the nature of planets, that appears suddenly and disappears in the same manner, and who, during the time of its appearance places itself in an orbit akin to those of

planets but very eccentric.”⁷¹ During Duchamp’s lifetime, the dictionary *Petit Larousse illustré* expanded on this “eccentricity” of comets, naming them “errant stars”: “COMET noun, feminine (lat. *cometa*; from gr. *komé*, hair). Errant star, describing a very elongated ellipse around the sun, accompanied by a trail of light called its *tail* or *hair* (*queue* ou *chevelure*).”⁷²

Royal Academician Pierre-Charles Le Monnier, working under the patronage of King Louis XIV at l’Observatoire de Paris, described the errance and apparent indifference of comets in the opening pages of his *La théorie des comètes* (Theory of comets). “There are few celestial bodies,” Le Monnier claimed, “whose trajectories are as varied, nor who appear subject to so many apparent inequalities, as comets, since we see them spread *indifferently* across all the regions of the sky.”⁷³ Le Monnier describes their indifference in opposition to the constancy of planetary orbits, almost personifying comets as contrarians. His theory sought, among other things, “to explain . . . in a word, if the Earth moves in one way, why do most comets seem, on the contrary, to move in an opposing way?”⁷⁴

Camille Flammarion referred to comets’ indifference as he popularized science for broad audiences in the late nineteenth and early twentieth centuries. In “History of a Comet,” he wrote about the science of comets with a novelist’s voice. Flammarion’s tale makes a character of the Great Comet of 1811, chronicling the changing Earth across the vastness of geologic time and the brevity of human history. In Flammarion’s tale, the comet exists on another plane, independent of (and perhaps superior to) the Earth, of which the comet is repeatedly described as “indifferent.”⁷⁵ “The indifference of the comet toward the Earth continued so long, that she returned twenty-four times to her perihelion without thinking of casting a glance upon the little terrestrial globe,” he noted.⁷⁶

With his 1921 haircut, Duchamp aligned himself with a celestial body known as “errant,” and “indifferent.” Such points of connection between the realm of natural history and his contemporary pursuit of an aesthetics of chance and of indifference would have interested Duchamp. His Paris visit of 1921 corresponded with the late period of his notes for the creation of *The Large Glass* (1915–23; figure 1.2). During this period, Duchamp wrote the phrase “Painting of precision, and beauty of indifference,” in the part of these notes that he reproduced as *The Green Box*.⁷⁷ “Irony is a playful way of accepting something,” Duchamp asserted. “Mine is the irony of indifference. It is a meta-irony.”⁷⁸ Tzara embraced indifference in his 1922 “Lecture on Dada,” proclaiming, “Dada is immobility and does not comprehend

the passions. You will call this a paradox, since Dada is manifested only in violent acts. Yes, the reactions of individuals contaminated by *destruction* are rather violent, but when these reactions are exhausted, annihilated by the Satanic insistence of a continuous and progressive ‘What for?’ what remains, what dominates is *indifference*. But with the same note of conviction I might maintain the contrary.”⁷⁹ “Indifference” became a catchword for Dada and neo-Dada artists. Duchamp’s quest for an aesthetics of indifference is well documented and variously interpreted. By shaving a comet into his hair, he transformed himself into a celestial body characterized by its state of indifference.

An unconventional haircut was a Dada creation in keeping with the errant behavior of Dada in general and, especially, the Paris Dada contingent’s penchant for taking theatrical behavior to the streets. Ribemont-Dessaignes’s letter to Tzara calling the effect of Duchamp’s haircut *inutile*, or useless, may signal the tonsure’s reception outside of the context of utility. In this sense, the comet cancels out potential clerical implications of the coiffure-as-tonsure: if it is “useless,” it could not function as an ecclesiastical identifier or a sign of humility before God. “Undoing” the utility of a haircut, the gaping star and the reverse-Mohawk effect of the comet’s tail become an absurd fashion.

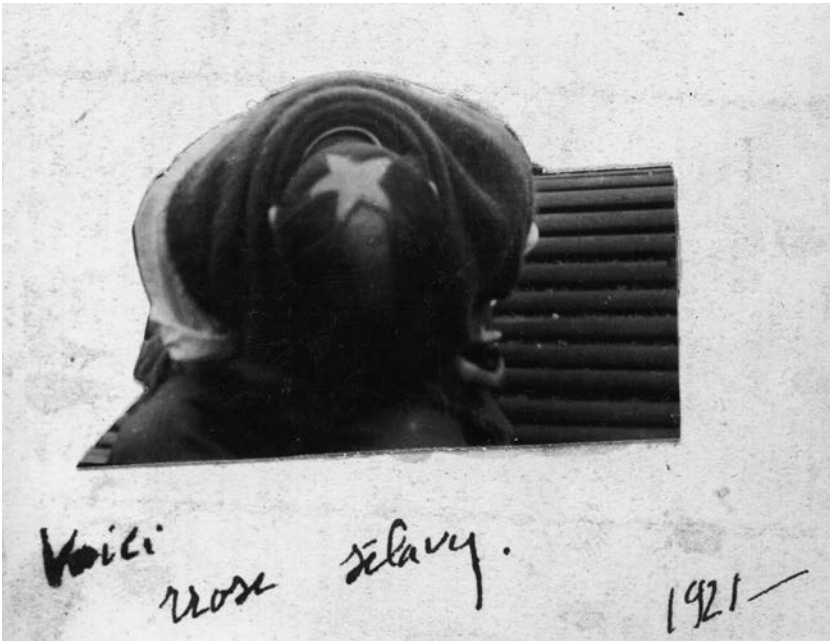
Comets have long stirred fear. Writings about comets from Diderot and d’Alembert’s *Encyclopédie* through Flammarion to recent authors repeated a litany of superstitions and fears surrounding comets.⁸⁰ Duchamp’s haircut may poke fun at notions of “cometary catastrophism,” theories of comets as harbingers of disaster that many modern scientists (including Flammarion) sought to dispel. Yet, in anticipation of the 1910 return of Halley’s Comet, Flammarion’s prestige gave credence to the fear that the end of the world was near. As the *New York Times* reported, the approaching comet’s tale contained cyanogen, “a very deadly poison . . . Prof. Flammarion is of the opinion that the cyanogen gas would impregnate the atmosphere and possibly snuff out all life on the planet.”⁸¹ Flammarion’s ideas about comets courted controversy. The action of his science fiction novel *La fin du monde* (The end of the world, also titled *Omega*) revolved around a comet on a collision course with Earth.⁸² *La fin du monde* evokes the science fiction of his contemporaries Jules Verne and H. G. Wells, with a penchant for meditating upon spiritual questions that recur in his fiction and nonfiction alike.

Flammarion speculated that comets could be vehicles for interplanetary communication, a sign of his belief that intelligent life could be found

elsewhere in the galaxy. He famously supported Percival Lowell's speculations that the canals of Mars were a likely indicator of extraterrestrial life forms.⁸³ Though his spiritist leanings might be less accepted by many readers of popular science today, his belief in the spirit world and life beyond death were consistent with ideas espoused by an array of credible thinkers, scientists, and leaders of the late nineteenth and early twentieth centuries. Flammarion concluded his "History of a Comet" on a philosophical note that couched the celestial body's indifference in terms of intellectual or spiritual superiority. His narrator communicates with the comet, whose perspective reveals to the earthlings that, "if we employ our intelligence, we shall acquire a value that will distinguish us from brute matter."⁸⁴ Flammarion's mysticism frames the indifferent comet in ways that Duchamp subjected to playful humor.

Duchamp's haircut revealed an understanding of the astrophysics of comets' behavior, demonstrated through the presence of the comet's tail at Duchamp's forehead rather than his neck. As Flammarion explained, "An idea still generally diffused among the public leads them to believe that the tails of comets follow them in their course, like a train of phosphorescent matter. This opinion is incorrect. These appendages are always opposite to the sun."⁸⁵ While the glowing embers of Duchamp's briar pipe might be the dust of the comet's tail, the pipe's bowl could equally signify the sun. Similarly, the pipe he clutches seems deliberately placed in relation to the "tail" of his comet haircut. Duchamp manipulated the textured blanket or shawl that he wears in figure 4.8 so that it simulates the rippling rounded wave forms of the coma of escaping gas and the dust tail that sometimes assume this specific configuration.⁸⁶

In addition to his fascination with the comet as a contemporary event and as an indifferent star, Duchamp's interest in comets may relate to their constitution. "What, then, is a comet?" Flammarion asked. "It is an extremely light nebulous mass . . . of which the larger volume is formed of gas."⁸⁷ Since Duchamp's haircut occurs in the midst of his protracted work on *The Large Glass* (1915–23), the gaseous nature of comets may relate to his meditations on "illuminating gas" in his notes for *The Large Glass* and other works. The indifference of comets takes on a potentially libertine role when one assesses their significance in astronomy, particularly their value in generating new understandings of the mechanisms of the cosmic order, from gravity to orbits. Would a cosmos powered by love, "the love that



4.8. Marcel Duchamp, *Voici Rose Séavy*, 1921 (printed 2008). Modern print from glass-plate negative, $3\frac{1}{4} \times 5$ in. (7.8 x 12.7 cm). Gift of Jacqueline, Paul, and Peter Matisse, in memory of their mother, Alexina Duchamp, Philadelphia Museum of Art, Marcel Duchamp Archive. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp.

moves the sun and other stars,” as Dante writes in the concluding line of his *Paradiso*, make room for errant and indifferent stars? As literary scholar Peter Dronke has written, “The motion of the heavens, through which the universe subsists, is brought about not by physical laws and forces, nor by divine providence, but by the power of love. Dante affirms this at a number of times throughout the *Commedia*. . . . Finally, it is this image that carries Dante’s concluding vision: through a flash of light that penetrates his mind, his desire and will are moved, in a revolving motion, by the love that moves the sun and other stars.”⁸⁸ Amidst a period of Duchamp’s career in which orbits and spirals recur, from comets to glassworks and beyond, his humor could still be tempered by a Dantean quest for a love that spins the cosmos. Ultimately, his *Large Glass* testified to a vision of frustrated love.

From Hairy Stars to Fashion Stars

Unlike meteors or the sun, comets have a direct etymological relation to hair that places Duchamp's gesture within the realm of his fascination with puns. In English and in French, "comet" is derived from the Greek term *Kometes*, meaning "hairy star." Illustrations of comets in the 1668 manual *Cometographia*, by Hevelius, elaborated this etymology by depicting the "long-haired stars" with scalp-like nuclei attended by flowing manes. A definition in the *Petit Larousse illustré* of 1906 points to this etymology and an interchangeable reference to a comet's "tail" (*queue*) or "hair" (*chevelure*).⁸⁹ As Diderot and d'Alembert stated with precision, "It is this trail of light that has given rise to the vulgar (popular) division among comets with tail, beard, or tresses [*comètes à queue, à barbe, & à chevelure*]: but this distinction is more suitably applied to the different states of the same comet rather than distinct phenomena of different comets."⁹⁰ Duchamp's coiffure is paradoxical, since he removed hair to "become" a "hairy star." Since the press referred to the mysterious celestial phenomenon of August 1921 as the "Lick Star," Duchamp's haircut might punningly comment on the comet in proximity to an unruly cowlick.⁹¹ The multiple identities of comets as being bearded or possessing beautiful hair and a desirable tail would have resonated with Duchamp's burgeoning fascination with sexual identity and humor.

When Duchamp shaved his head in 1921, he experimented with hair's power to manipulate identities on multiple levels. Duchamp had played with hair's ability to transform when he drew a moustache and goatee upon a reproduction of the Mona Lisa and called it *L.H.O.O.Q.* in 1919 (figure 2.5). Long before Duchamp's wordplay was embodied in the title of *L.H.O.O.Q.*, countless illustrators, cartoonists, and humorists elaborated the potential for sexual jokes about comets having "a nice tail."⁹²

Like the comet's variable phases, Duchamp's Mona Lisa oscillates between masculine and feminine genders. *Queue*, in French, is a sexually loaded term in ways that parallel the meanings of the word "tail" in English. *Queue* plays on the conflation of its primary meaning, referring to an animal tail, with its slang usage to refer to the penis. In familiar and popular francophone usage, the meanings of *queue* range freely from marital infidelity to leaving unpaid debts to "bamboozling" someone.⁹³ During his youthful work as an illustrator of single-panel comics, Duchamp played with the multiplicity of meanings that *queue* could hold in the phrase *piano*



4.9. Marcel Duchamp, *Monte Carlo Bond* (No. 12), 1924. Cut-and-pasted gelatin silver prints on lithograph with letterpress, 12¼ x 7½ in. (31.2 x 19.3 cm). Gift of the artist. Museum of Modern Art, New York. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo credit: © Museum of Modern Art / licensed by SCALA / Art Resource, NY.

à queue meaning “grand piano.”⁹⁴ As scholars including Peter Read and Sébastien Rongier have shown, a fascination with the erotic potential of hair runs through Duchamp’s oeuvre.⁹⁵ Hair and shaving contributed content and form to the collaborative photographs Duchamp made with Man Ray during 1921, including a quartet of shaving-lather images used in the creation of the *Monte Carlo Bond* (figure 4.9) and the multiple photos of Rose Sélavy. Each of these examples, like the tonsure of 1921, significantly transforms the body through hair manipulations of addition (as in the facial hair of *L.H.O.O.Q.*) or subtraction, through shaving. Through these minor manipulations, Duchamp transformed identities.

Duchamp’s comet hairstyle operated as both fashion and brand, distinguishing him as a potential celebrity on the streets of Paris. This may clarify the relationship Duchamp conceived between the tonsure and the identity of Rose, since he inscribed one of the photographs showing his

tonsured head with the phrase “Voici Rose Sélavy” (figure 4.8). Helen Molesworth has pointed to Duchamp’s interest in trademarks, noting that his collaboration with Man Ray on the readymade *Belle haleine, Eau de toilette* (1921) masquerades as a trademarked consumer package, later “photographed and used as the cover of New York Dada, running . . . as a sort of a print ad.”⁹⁶ Notes from *The Green Box* may help to situate the comet haircut within the various activities Duchamp pursued while working on *The Large Glass*. Chief among these is his reference to an “enfant-phare,” or “headlight child [who] could graphically, be a comet, which would have its tail in front, this tail being an appendage of the headlight child appendage which absorbs by crushing (gold dust, graphically), this Jura-Paris road.”⁹⁷ Merging nature, religion, and technology, the headlight child could be represented as a comet, functioning like a trademark to brand a specific object, such as a vehicle—or an artist.⁹⁸

His comet tonsure of the same year functioned as precisely the sort of distinguishing mark that could have been registered as a trademark. Trademark registration in the United States began when the Averill Chemical Paint Co. was issued the first registered trademark on October 25, 1870.⁹⁹ Within a few years, thousands of trademarks were registered annually. Astronomical references have been so popular as registered trademarks to warrant their own category with distinct classifications that range from sun signs to stars (classified by their number of points), the Milky Way, and comets.¹⁰⁰ Méliès adopted the star as his mark, adding it to each film in an effort to retain property rights over his creations.¹⁰¹ Duchamp’s comet branded him as a commodity projecting an identity linked simultaneously to Dada theatrics and to celestial mechanics.

Those who saddled their brands to comets in the nineteenth and twentieth centuries found that, where goods and services were concerned, comets apparently brought good business. All manner of things were sold under the seal of the comet, especially in anticipation of the return of Halley’s Comet in 1910. Some harnessed fears that the poisonous gases of the comet’s tail (described by Flammarion, earlier in the chapter), would be deadly, selling precautionary “comet pills.” Others, like the Clemak Razor Company, laughed off fears of a comet collision with Earth (figure 4.10). In the Clemak ad, their safety razor becomes a comet; a five-pointed star as its head parallels the razor cartridge, while the comet’s tail echoes the razor handle. “My word! That was a close shave!” exclaims a cartoon figure with a terrestrial globe for his head, while other planets look on. Although



4.10. Unidentified artist, "My word! That was a close shave!" advertisement for the Clemak Safety Razor, *Quiver* (London), November 1914, ix. Collection of the author.

there is no reason to believe that this image was a direct inspiration for the five-pointed star and tail of Duchamp's comet tonsure, both capitalize on current events to brand a product.

Given the preponderance of celestial branding, Duchamp's head would not have been the only comet visible on the streets of Paris in 1921. There, Duchamp could easily have encountered establishments with comet-inspired names, including the Brasserie-Restaurant de la Comète (14, boulevard Montmartre)¹⁰² and the Brasserie de la Comète (24, boulevard Poissonnière).¹⁰³ As with these eateries, a variety of consumer goods have, since the nineteenth century, been given names that associate them with comets for various reasons. Following the Great Comet of 1811, discovered by the French astronomer Honoré Flaugergues, the wine vintage of that year was so exceptional that it salvaged a suffering wine industry. Veuve Clicquot celebrated their new techniques for champagne production in 1811 by

marking caps and labels with a comet. Other vintners followed suit. Wines from vintage years in which comets appeared have continued to be sought after and appreciated as distinct. Appearances of comet-named beers in the nineteenth and twentieth centuries may have begun as an extension of this association linking wine with comets. Despite the efforts of professional astronomers such as Flammarion to debunk the power of comets to improve a vintage, these tenacious myths persist today.¹⁰⁴ So, too, does a preponderance of celestially inspired branding continue today. Understanding the cultural obsession with astronomy, fashion, and the emergence of modern product identity branding during the 1920s helps to situate Duchamp's activities of the decade in their initial cultural milieu. For the artist who promoted an aesthetics of indifference, an errant expatriate at home in the world, the comet proved to be a timely brand for a brief moment.

Duchamp's tonsure adapted his own body to the long history of artists rendering celestial phenomena for reasons ranging from the fantastic to the scientific. Spanish art historian Juan Antonio Ramirez interpreted the tonsure as a pun, the "étoile" of a starry coiffure substituted for the painted "toile" of the artist's canvas.¹⁰⁵ As an embodiment of a comet, Duchamp's haircut engaged a long tradition of comets in art, while replacing the painter's canvas with a performative "canvas" of his own body. Art historian Roberta J. M. Olson has documented artists' widespread fascination with comets, emphasizing its escalation during the 1800s, a period she has dubbed "the comet-crazy century."¹⁰⁶ Indeed, the late eighteenth through the nineteenth century was a pivotal epoch in which artists' observations contributed immensely to the development of astronomy and related scientific pursuits.¹⁰⁷

From the eighteenth century until the 1920s, the sighting of previously unidentified celestial phenomena held the potential to unlock new secrets of the universe.¹⁰⁸ For this and other reasons, astronomy was a field of fiercely nationalistic competition and pride. French observers were especially successful in their declarations of new observations. Charles Messier (1730-1817) and Jean-Louis Pons (1761-1831) were among the renowned comet hunters of their age.¹⁰⁹ Messier, dubbed "le furet des comètes" by Louis XV for his ability to ferret out comets, was immortalized in the streets of Paris by a street named in his honor. Rue Messier, in the fourteenth arrondissement of Paris, still stands a few minutes' walk from the residence of Duchamp's dear friend H. P. Roché who lived at 99, boulevard Arago. François Arago, for whom Roché's street was named, wrote

famously about comets and their potential for indicating extraterrestrial life.¹¹⁰ These streets are filled with history and with connections to the ideas Duchamp held dear. Astronomical observations supported the French missions for the standardization of time, the calendar, and other forms of measurement including the standard meter. Duchamp might have been reminded of this whenever he visited Roché in Paris, and especially on the street where he lived during 1921 with Yvonne Chastel at 22, rue de La Condamine. Duchamp's 1921 residence was in the street named for Charles Marie de La Condamine, whose writings reported his comet sightings. La Condamine's travels in Peru were influential in determining the length of the standard meter.

Cinematic and Postcinematic Investigations: Spirals and Shifting Scales

Anémic Cinéma, Duchamp's first foray into filmmaking, linked the "star" Rose with the spirals that recur throughout Duchamp's work of the 1920s and '30s. Crediting Rose Sélavy with the film's authorship and intellectual property, the final frame of the film reads "COPYRIGHTED BY Rose Sélavy 1926," inserting Duchamp's thumbprint beneath Rose's signature.¹¹¹ Might Rose's celestial associations offer clues to new understandings of Duchamp's filmed spirals? Duchamp began to conceive of the film in 1925, the year he finished the sculptural *Rotary Demisphere* (*Precision Optics*) under the patronage of fashion magnate Jacques Doucet. Difficult to achieve, *Rotary Demisphere* featured a dome-like, white half sphere upon which black eccentric circles were painted. When activated, the movement of the *Rotary Demisphere* created a hypnotic sense of movement and illusion of depth. Alternately titling the machine "precision optics," Duchamp borrowed a phrase used for the optics of cameras and telescopes to create a device that played upon a viewer's optical perceptions.

After the *Rotary Demisphere* was completed in 1925, Duchamp collaborated with Man Ray to create a stereoscopic film of the *Rotary Demisphere* in motion. Had the experiment succeeded, a viewer of the film would have experienced it while wearing a pair of anaglyphic glasses to heighten the simulation of three-dimensional depth created by the demisphere's moving spirals. Ever *bricoleurs* (do-it-yourselfers), the collaborators built their own device in which to process the experimental film. Due to an accident, all but a few frames of the film were spoiled.¹¹² This experimental film and

Duchamp's general interest in optical devices, as Lars Blunck has demonstrated, related to the artist's larger investigation of questions associated with the vagaries of linear perspective. Despite the avant-garde nature of the attempted film, Man Ray and Duchamp were not isolated in their fascination with techniques for stereoscopic photography and film. Advertisements for cameras to produce stereo imagery appeared in the opening pages of most issues of *La Nature* during the 1920s and '30s. Such advertisements, offering the promise of scientific documentation and virtual three-dimensionality, appealed to amateurs and professionals alike.

Films such as *Anémic Cinéma* and the failed experiment in stereoscopic projection employing the *Rotary Demisphere* could, alternately, be projected on a small scale for an individual viewer or on the larger scale experienced by crowds in a café or movie palace. Moving pictures thus offered the creator the opportunity to adapt to changing demands of different venues and growing audiences; with these changes came opportunities for differing levels or kinds of immersion. During the 1930s, Duchamp's creative energies increasingly focused on exhibition design. Alongside the grand scale on which Duchamp designed the embodied experience of exhibits, especially the 1938 Exposition internationale du surréalisme, he simultaneously worked on an intimate scale to craft boxes and books through which one's experience would be distinctly personal. His collaboration and friendship with Mary Reynolds seems to have spurred Duchamp's explorations in varying scales of experience.

Creative Collaboration with Mary Reynolds

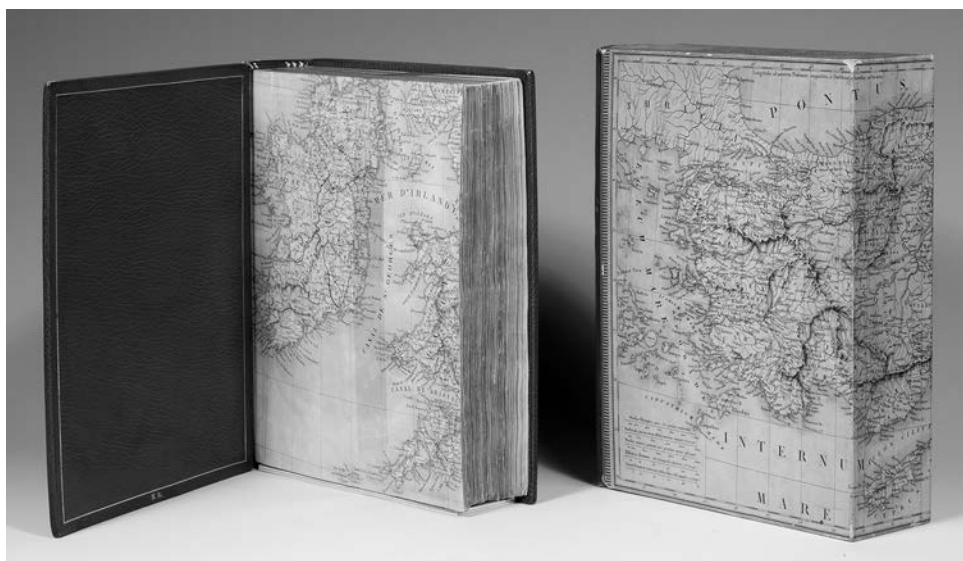
During the 1930s, Duchamp maintained an apartment on the rue Larrey, in Paris. He shared the company of Reynolds in her residence at 14, rue Hallé, simultaneously.¹¹³ Reynolds's most enduring creative activities were her elaborately sculpted and crafted bookbindings, many of which were preserved in the Mary Reynolds Collections of the Art Institute of Chicago.¹¹⁴ Beginning in 1929, Reynolds studied bookbinding under the tutelage of Pierre Legrain, recognized internationally for his innovative book designs. As Reynolds's biographer Susan Glover Godlewski has suggested, Duchamp's friendship with Doucet may have facilitated Reynolds's invitation to study in Legrain's studio. Doucet, a successful Parisian fashion designer, had financed Duchamp's experiments with kinetic art leading to the *Rotary Demisphere*.¹¹⁵ Doucet commissioned Legrain to design new frames

for the modern artworks he collected including Picasso's painting of *Les demoiselles d'Avignon* (1907). An article memorializing Doucet and Legrain after their deaths referred to Duchamp as contributing to the interior decoration of the couturier's "palace" on the rue St. James in the fashionable Parisian suburb of Neuilly: "The dressing room was decorated by Picabia and Marcel Duchamp, and in his bedroom Doucet had paid homage to the photographs by an American, Man Ray."¹¹⁶

The death of both Legrain and Doucet in 1929 likely complicated matters for Reynolds's pursuit of design education and Duchamp's quest for patronage. Reynolds's study with Legrain may have continued through her independent analysis of his book designs and continued training with the artisans she met in his studio. As Godlewski noted, Legrain worked as a designer but left the fabrication of his designs primarily to the craftsman employed in his studio.¹¹⁷ During her brief apprenticeship, Reynolds learned the cerebral activities of design and the technical skills to craft the finished products themselves. The design of each unique binding made by Reynolds was well suited to the contents of the book and the reputation of the author. Each binding functioned as an exquisitely sculptural object designed with great tactile qualities. Reynolds was especially well attuned to the intimate sense of scale of a book. Her work displays a tremendous attention to the integration of form and content, and to the physical and cerebral sensations that combine in the act of reading. Duchamp and Reynolds collaborated in making a group of stunning bindings for books, an experience that Janine Mileaf suggests may have informed Duchamp's later work on boxes of his notes reproduced in facsimile, such as *The Green Box* of 1934.¹¹⁸ Reynolds's experience with these intimately scaled objects complemented Duchamp's wide-ranging explorations of scale from the readymades through the boxes, book designs, and installations of the years they shared together.

Reynolds and Duchamp likely shared an interest in maps that materialized in very concrete ways, as two works especially underscore. The dates when these works were created are difficult to pin down. The first work, a book binding by Reynolds, was made sometime after the book's publication in 1922 and before Reynolds's untimely death in 1950. The second, a room decorated by Duchamp, was made during an unidentifiable range of dates during this period.

One of Reynolds's unique bookbindings stands out as especially cartographic in its conception, a copy of James Joyce's *Ulysses* (figure 4.11). Though born in Ireland, Joyce lived an expatriate life including many years



4.11. James Joyce, *Ulysses*, with unique binding by Mary Reynolds (Paris: Shakespeare and Co., 1922). Mary Reynolds Collection, Ryerson and Burnham Libraries, Art Institute of Chicago. Photo credit: Ryerson and Burnham Libraries, Art Institute of Chicago.

of Paris residence. There he befriended Reynolds and likely encountered Duchamp.¹¹⁹ The Parisian bookstore Shakespeare and Company published Joyce's monumental and experimental novel *Ulysses* in 1922. Reynolds designed an elaborate binding for her copy, printed on handmade paper (number 301 of one thousand copies). Joyce's novel transformed the ancient Homeric epic of *The Odyssey*, in which its hero Odysseus—known to the Romans as Ulysses—traveled through a decade of adventures while returning home from the Trojan wars. Joyce's *Ulysses* replaced Homer's gods and heroes of antiquity with mere mortals. Odysseus becomes Leopold Bloom, Telemachus becomes Stephen Dedalus, and Molly Bloom takes the place of Penelope. Reynolds bound Joyce's book in blue Morocco leather and added maps of Asia Minor to the book as endpapers. She covered a slipcase box with more maps of the region, continuing the cartographic theme of her design. In Joyce's novel, the reader shadows Bloom through a single day, as he walks in the city of Dublin, Ireland. Expatriates all—Joyce, Reynolds, and Duchamp—each might have identified with the mythic tale of Odysseus and the modern story of Bloom, filled with geographic referents.

Visiting Duchamp's room in Reynolds's rue Hallé home might have

seemed like the large-scale equivalent of an imagined existence within her box for *Ulysses*. Jean Suquet, one of the French Surrealist and a Duchamp scholar, described the interior with a degree of awe. Inside Reynolds’s home he encountered “a small space papered from floor to ceiling—and the ceiling, too, and the door’s back, as well—with Michelin road maps placed next to one another, but without any order. Thus the road Le Havre—Evreux, for instance, was continued by the road Albi—Arles, and so on, a whole night of geographical maps! ‘Marcel has done this,’ Mary Reynolds, overjoyed, told me.”¹²⁰ Duchamp’s affiliation with Reynolds thus led to a significant exploration of an interior “environment” with distinctly geographic points of reference.

Suquet identified Michelin as the source of the maps used by Duchamp in his playful transformation of the otherwise undocumented room inside Reynolds’s (now destroyed) home. Michelin maps have long been characterized by their dependable precision and ease of use. Like the individual



4.12. “Carte Routière de Dion-Bouton,” map, ca. 1900. Collection of the author.

sheets of the Cassini map or later versions of the “Carte de la France,” the sheets are made to fit seamlessly to reconstruct the French landscape and its pathways. Following the lead of the Cassini map, cartographers of the automotive age created a system in which each map is designed to align with its appropriate partners. Thus aligned, they connect their coordinates along longitude and latitude, highway or byway, marking the frontiers and continuities of individual French *départements* and distinguishing their agglomeration as the nation, the Hexagon, from its bordering neighbors.

Duchamp’s installation of deliberately impossible itineraries playfully challenged cartography’s status as a tool of representation or navigation. By the time Suquet visited the map room in Duchamp’s home, Michelin had become the best-known distributors of commercial road maps. The concept of continuous road maps had been pioneered early in the twentieth century with the “cartes routières” issued by De Dion-Bouton, whose Puteaux factories Duchamp would have known (figure 4.12). Duchamp’s room in Reynolds’s home might be analyzed as a workshop of sorts, a space in which the artist toyed with the concept of a pataphysical geography. The resulting cartographic room produced an immersive space that spurred both intellectual and physical experiences. By creating “real” maps that lead to impossible destinations, Duchamp’s map room effectively created a space of pataphysical geographies unmoored from the demands of ground truth from any known geography.

In this way, Duchamp’s room was a little-known parallel to the experimental *détournements* (deliberately turning something away from its normal course or purpose) of the Situationist International and later practitioners of “psychogeography.” As the Situationist Guy Debord later defined it, this set of practices comprised a “study of the precise laws and specific effects of the geographical environment, consciously organized or not, on the emotions and behavior of individuals.”¹²¹ Debord and the Situationists prolonged and transformed many ideas from the Surrealists, emphasizing aspects of cultural criticism that were often absent from the goals of those close to Breton. The Situationists and others among their contemporaries shared the Surrealists’ fascination with geography and embodied experience.¹²²

CHAPTER FIVE

INTERSTELLAR VOYAGES AND SURREALIST GEOGRAPHIES

*The Paris World's Fair, Palais de la découverte,
and Exposition internationale du surréalisme*

• • • During the decade of the 1930s, Marcel Duchamp directed increasing efforts toward the creation of immersive experiences and experiential environments. His radical gestures of that decade included the design of the 1938 Exposition internationale du surréalisme, which opened in a darkened gallery that its visitors traversed with the aid of flashlights (figure 5.1). Lights in hand, they passed through an area where signs marked “the most beautiful streets of Paris,” a combination of real and imaginative geographies. From there the visitors used the Mazda lamps to navigate through other geographic zones until they came to one in which some 1,200 coal sacks filled the space of the ceiling. In this chapter, I analyze the 1938 exhibit in the context of events associated with the World’s Fair of 1937, interpreting Duchamp’s activities in the context of popular science at that fair.

French statesmen Paul Valéry and Jean Perrin worked to promote the union of art and science in the public eye throughout the 1930s. They particularly accomplished this union through the Exposition internationale des arts et techniques dans la vie moderne and the science museum conceived as a central aspect of that 1937 World’s Fair, Perrin’s Palais de la découverte (figure 5.2). Perrin, who also launched the CNRS (Centre national de recherche scientifique) proposed to bring science to the masses through the new museum. With sections dedicated to astronomy, optics, botany, physics, biology, genetics, medicine, surgery, mathematics, chemistry, radioactivity, cosmic rays, and “synthèse atomique,” complemented by historical reconstructions and scientific films in a purpose-built cinema,



5.1. Marcel Duchamp, installation design, Exposition internationale du surréalisme, Paris, 1938. © 2015 Artists Rights Society (ARS), New York; ADAGP, Paris.

the palais reached out to wide audiences to engage with historical and contemporary science in a multisensory and “hands-on” environment. In 1938, Surrealism offered its own approach to multisensory exhibition design. Surrealism’s critics have long challenged the movement’s exhibitions for being closely allied with fun-house rides. The Centre Pompidou’s 2013–14 reassessment of Surrealism perpetuated fun-house associations when it applied the French term *train fantôme* to a section of that exhibition.¹ As



5.2. Entry to the Palais de la découverte, Paris, in 1937. Photo credit: © Palais de la découverte.

I argue below, the 1938 exhibition offered a Surrealist fun house that borrowed from the approaches to embodied experience promoted by the Palais de la découverte, planetarium, and the *train fantôme* called the Stellarium, a simulated interplanetary rocket journey. Duchamp's exhibition design creatively emulated practices of the fair, including its fascination with photo-electric eyes, nocturnal light-and-sound displays, and the popular sciences on display at the Exposition internationale des arts et techniques dans la vie moderne.

Duchamp's dramatic installation of the 1938 Exposition internationale du surréalisme has been recognized by art historian Lewis Kachur and others as a significant precursor of "Installation Art" and has merited renewed analyses in the twenty-first century.² Recent attempts to re-create Duchamp's exhibition design offer one measure of this installation's continuing importance for contemporary audiences. In the years 2012-13 alone, at least three major exhibitions reinstalled the ceiling of coal sacks, in Genk, Belgium (for the contemporary art event Manifesta 9), in Paris (as

the point of departure for the exhibition *L'art en guerre, France 1938-1947* in the Musée d'art moderne de la Ville de Paris), and again for the staging of *L'art en guerre* in Bilbao (Guggenheim Museum in Bilbao, Spain).³ Fascination with Duchamp's 1938 installation continues to grow. As a re-created gesture of avant-garde exhibition design, or an artifact of installation art's prehistory, Duchamp's "exhibition as artwork" continues to exert its influence.

Duchamp's optical experiments and fascination with spirals may be seen as a transitional phase in his work, linking the singular stars of the 1920s with his subsequent emphasis on constellations of works and their cosmic implications. In this sense, "cosmic" is far removed from the mystical interpretations that might have intrigued a younger Duchamp. By the 1930s, a cosmic interpretation would be moored instead in the burgeoning awareness of multiple galaxies beyond the Milky Way. The 1930s witnessed the emergence of a distinctly new form of "cosmic consciousness," rooted in positivist science and the embodied experience promoted by the architecture of the modern planetarium.

Art Deco Astronomy and the Projection Planetarium

From the mid-1920s through the 1930s, increasing ranks of artists and patrons embraced a machine aesthetic; the celebration of science and industry characterized much of the contemporary art and design of this period. The artist Amadée Ozenfant and the artist/architect Charles-Edouard Jeanneret (better known as Le Corbusier) promoted contemporary science in their influential journal *L'Esprit Nouveau*. Published between October 1920 and January 1925, *L'Esprit Nouveau* displayed a strong awareness of contemporary scientific developments while promoting a rationalist industrial aesthetic aligned with the Purist movement Ozenfant and Jeanneret promoted in painting. Within a decade, the international fascination with the machine aesthetic could be measured by the title of the Museum of Modern Art's first exhibition dedicated to design, the groundbreaking *Machine Art 1934*. During an era when ocean liners were the primary mode of transatlantic travel, and air transportation emerged as a nascent industry, the decorative schemes accompanying boats and planes increasingly featured celestial and geographic imagery. Astronomical and cosmological iconographies figured prominently in Art Deco architecture and design, to a degree that merits further scholarly consideration.⁴ From Hoover Dam

to the Empire State Building, the engineering triumphs of pedestrian and spectacular structures alike were increasingly decorated with celestial motifs. When the Empire State Building opened on May 1, 1931, it garnered international attention as the tallest building on the planet. At the same time that the secular spire of its zeppelin mooring mast reached into the heavens, visitors who stepped inside the skyscraper could gaze into a glowing representation of the cosmos, painted in gold leaf, on the ceiling of its grand lobby. Decorative programs such as this one expressed faith in progress, a triumphalist vision of human mastery of the forces of the universe through new discoveries in science, technology, and engineering.

Progress brought astronomy to broad audiences in a distinctly new way during the 1930s. A new architectural form took hold of the popular imagination, the projection planetarium. Although the dream of the planetarium is an ancient one, the modern planetarium emerged following the first demonstrations of a projection system by Carl Zeiss in Jena, Germany, in 1925. The 1930s were glorious years for the construction of planetariums. Major cities vied to open their own planetariums, in rapid succession: across the decade of the 1930s in the United States alone the cities of Chicago, Los Angeles, New York, and Pittsburgh opened new purpose-built structures to house Zeiss projection systems.

A distinct architectural form, modified from the ancient Roman dome, distinguishes the external appearance of modern planetariums. In use, its potential to create a unique environment for education and entertainment depends on the planetarium's ability to create an immersive experience. By darkening the interior of the planetarium and projecting light upon the domed ceiling, the planetarium simulates the experience of looking into the night sky. Narratives delivered by an officiating speaker present scientific data aided by special effects that complement the scientific commentary. A glimpse at the programs of the Paris planetarium or its international counterparts throughout the twentieth century show common practices in the types of tales they tell. Planetariums offer virtual travel that transports audiences to geographically or temporally distant places. One might travel to a polar region or to the ancient past, see the night sky in one's own neighborhood for any day in history, or witness rare phenomena such as the Northern Borealis in the duration of a single planetarium presentation. Among the stories told frequently within the planetarium, one finds tales of time travel to specific historical moments, to witness, for instance, the Star of Jerusalem described in the biblical New Testament's chronicle of the

birth of Jesus. Another perennially popular feature has long been the space voyage, simulating travel to the moon, across our solar system, or to distant galaxies. As Alison Griffiths noted in her excellent study of immersive technologies, “The planetarium quickly turned to the world of popular culture for inspiration on how to transform the celestial heavens into an entertainment medium, as well as an object-lesson in astronomy. The repertoire of suitable planetarium topics quickly expanded, adding narrative, music, sound, and special effects to the original astronomy lesson.”⁵

As a new architectural space whose uses were not entirely predetermined, the planetarium offered opportunities for the avant-garde to engage with the cosmos. New York’s Hayden Planetarium, an arm of the American Museum of Natural History, opened its doors to the public on October 3, 1935. On June 6, 1938, the Hayden Planetarium hosted the first performance of *The Planets: A Modern Allegory*, a new play by Alfred Kreymborg, an associate from Duchamp’s early days in New York.⁶ Kreymborg wrote his play as a radio drama that premiered as a live broadcast from the Hayden Planetarium by the National Broadcasting Service (NBC).⁷ In the Hayden Planetarium a live performance of Gustav Holst’s music *The Planets Suite* (composed 1914–16; premiered 1918) accompanied Kreymborg’s play. However, neither Holst’s music nor Kreymborg’s play were particularly engaged with contemporary scientific thought. Holst’s musical suite was inspired by astrology, and Kreymborg’s play was a political allegory in the service of the idea of universal peace. Planetariums and their links to the cosmos could be adapted to suit the needs of the modern world. Within a decade, that would mean redirecting planetariums programming to align with Cold War politics. By contrast, the early projection planetarium was a site of opportunity, a place where cosmic dreaming could accompany immersive experiences.

Astronomy was fashionable in 1937, not only in the new planetariums but in the pages of *Vogue* magazine too. Amidst the June 15, 1937, issue’s fashion report from Paris, a dramatically theatrical two-page spread showcased dresses by Lanvin, Vionnet, Molyneux, and Henri Bendel, alongside jewelry by Boucheron. “Among the Mid-Season Stars,” its title proclaimed, “sky-rocketing again across the French horizon is black tulle,” contrasted with “Vionnet’s white mousseline dress—white as the Milky Way—the great arc of a skirt spangled with stars of navy-blue chantilly lace.”⁸ If the caption writers struggled to make metaphors to match the image, its visual poetics spoke to the impact of Surrealism on popular visual culture by this



5.3. Postcard showing the Paris planetarium constructed for the scientific attractions area of the Exposition internationale des arts et techniques dans la vie moderne, Cours Albert-Premier, Paris, 1937.

time. In the photograph, three models stand silhouetted against a velvety darkness punctured by stars. Bare tree limbs litter the landscape that surrounds them, and a mysteriously monumental form links earth with sky. Astronomy captured the popular imagination. In Paris, a young astronomer named Paul Couderc made his name with a popular book read by young and old, titled *Parmi les étoiles* (Among the stars; 1938).⁹ By this time Paris had its own planetarium too, associated with the Palais de la découverte (figure 5.3, plate 15). Inside the planetarium, one could truly be “among the stars” regardless of whether it was day or night outside.

When the new Palais de la découverte opened in Paris during the 1937 Exposition internationale, Fernand Léger and other contemporary artists contributed paintings and sculptures celebrating science in a similarly heroic vein. Organizers of the palais embarked on an ambitious plan, only partially realized, to bring artists and their work into the space of the museum.¹⁰ From its inception the programming at the palais incorporated displays of contemporary and historical art. James McManus has found ephemeral printed matter from the early palais indicating that Duchamp’s

close friend and accomplice H. P. Roché loaned art to an early exhibit there.¹¹ The interest in art and science showed by the directors of the palais, combined with the participation of Duchamp's friends and colleagues, might have provided ample reason for him to visit the new science center. Even if he had not visited the exposition or the Palais de la découverte, Duchamp would have readily acquired a clear sense of the mission of the exhibit and the science center from news media or from conversations with friends.

Fernand Léger's painting *Le transport des forces* assumed pride of place in the central hall of the lower level of the palais, not far from the entrance (figure 5.4, plate 17). Pierre Girieud's large allegorical painting *Astronomy* (1937) could be glimpsed upon entering the palais, or from a less dramatized distance by viewers traveling through the museum's astronomy divisions upstairs. When French artist Jacques Mauny reported on the exposition for the *New York Times*, he invoked Duchamp and others of the avant-garde to describe the Palais de la découverte, mindful of the gap between their art and the works commissioned by the palais.

Science is billeted in the Grand Palais. . . . In the distance, laboratory demonstrations, medical images, might be mistaken for Miró, Arp, Ernst, Man Ray, and Marcel Duchamp's divertissements. But in the profound new religious mystery that envelops the visitor, confronted by the implacable majesty of science in action, even the masterly decorations of Léger and Lipchitz are somewhat like clownesque echoes. As for the other decorations, very plentiful, they might be murals forgotten by the last Autumn Salon. The old Surrealist gang has been forgotten, but it could find a place near the *Transparent Man* from the Dresden Hygiene Museum.¹²

The *Transparent Man*, a colossal anatomical model, stood nearby in the Parc des Attractions adjoining the planetarium—a suitable place, indeed, for the Surrealists. In figure 5.3 the round structure housing the *Transparent Man*, or *L'homme de verre*, can be seen to the left of the planetarium entrance (identifiable by the tall letters MME DE visible on it).

Despite the efforts of the science museum to integrate art, as Mauny recognized, most of the commissioned works seemed less contemporary than the science exhibits themselves. Unlike the iconographies of triumph and celebration promoted by Art Deco, *L'Esprit Nouveau*, and the Palais de la découverte, Duchamp's creative activities during this period challenged the



5.4. Paul O'Doyé, photograph of the grand staircase to the astronomy section, Palais de la découverte, 1937. Fernand Léger's painting *Le transport des forces* (*Power Transmission*, 1937), partially visible on the ground floor to the left, was commissioned for the palais as part of its efforts to integrate art and science. Photo credit: © Palais de la découverte; P. O'Doyé.

heroic narratives of modern science. Whereas an Art Deco interior could refer to the cosmos, a planetarium offered a virtual journey to the stars, and new globes might impart geographical understanding, Duchamp's designs for the 1938 Paris Surrealist exhibit offered distinctly Surrealist geographies and an alternative trip through the Milky Way.

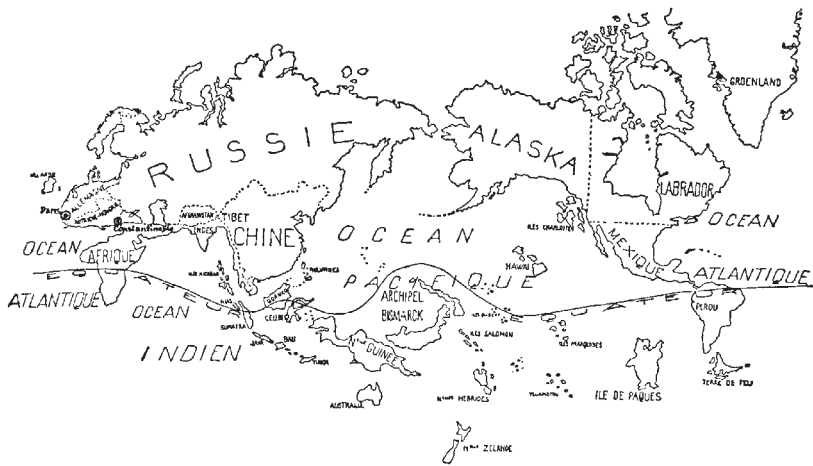
Art historians Elena Filipovic, James Herbert, Alyce Mahon, and others

have suggested that audiences attending the 1938 Surrealist exhibit could have readily interpreted the event as a parody of the Exposition internationale and other influential exhibits inaugurated the previous year.¹³ Undoubtedly the Surrealist exhibition would have been interpreted in relation to the spectacular displays of the fair, from the artist Wols's incomparable mannequins designed for the fair to its dramatic spectacles of the sound-and-light show.¹⁴ No study to date has focused on the Surrealist exhibit's relationship to public science presentations. The success of the Surrealist exhibition depended on a visitor's intellectual engagement through multi-sensory experience in much the same way that Perrin's new museum did. In a fashionable gallery located less than a kilometer from the Palais de la découverte, Duchamp's 1938 exhibition design offered visitors a dramatic passage through a Surrealist's geography of Paris.

The planetarium built to accompany the Palais de la découverte was especially significant for Duchamp's exhibition design, for the experience of both hinged upon an aesthetics of immersion. The Palais de la découverte and its planetarium combined an experiential aesthetics with a politicized mission to integrate the sciences and humanities. Although scholars have noted Duchamp's fondness for the palais, inadequate attention has been given to its role in connecting modern art and science through a commitment to artistic patronage. Although World War II and subsequent financial and political concerns disrupted the programmed artistic patronage of the palais, in 1937 it set the stage for postwar visions of art's possible engagement with science to open a broad public's imagination to new ways of seeing. For Duchamp, the palais and the popular scientific attractions of the 1937 exposition were catalysts offering new modes of experience that transformed his work from the 1930s through his final creations.

Nocturnal Geographies, Surrealist Geographies

Surrealism embraced geography in distinct terms, proposing geographies of the marvelous and embracing the creative power of *dépaysement*, a word referring to a practice of deliberately entering a state of disorientation that these artists invoked in their quest to encounter what they called the marvelous. The Belgian journal *Variétés* in 1929 published a Surrealist map of the world whose imaginative cartography redefined geopolitics and continents in playful ways (figure 5.5). The Surrealist map greatly reduced or eliminated some areas (the United States is virtually absent) while



5.5. Unknown artist, “Le Monde au temps des surréalistes” (The world in the time of the Surrealists), *Variétés* (June 1929): 26-27.

immensely exaggerating others (such as Greenland and Easter Island). Within this map the equator rose, surged, and dipped as it coursed around the globe, no longer limited to its identity as a straight line demarcating northern and southern hemispheres. The map’s transformation of “ground truth” reflected the cultural predilections of these artists and their fascination with exotic geographies. The north dominated the Surrealist map, from Romanticism’s birthplace in Germany to the colder climes of Russia and Alaska. For the Surrealists, one need not travel to experience geography in a distinctly new way. All that was required, suggested André Breton, was the correct attitude; in this, he and his cohort borrowed the concept of the “marvelous,” which could transform one’s experience of the everyday. Actual travels eventually supplanted the armchair dreams of the Surrealists.

The darkened interior of the 1938 exhibition presented a nocturnal space like that of the Surrealists’ nighttime walks across Paris as represented in Breton’s *Nadja* and in Louis Aragon’s *Paysan de Paris*. At the same time, as discussed below, the darkened interior evoked the spectacle to be experienced in the planetarium newly built for the 1937 exposition. While Surrealist literature turned to the disorienting *dépaysement* that could be produced by wandering the city in such a way that familiar landscapes gave way to the unfamiliar, nocturnal perambulation could be even more dramatic, more likely to produce the effects of the marvelous than travels in daylight.

The pages of the Surrealist journal *Minotaure* dedicated space to articles about the science, mystery, and pleasures of the night. Photography by Brassai, among others, illustrated these pages. Night photography was not new; astronomers of the nineteenth century opened their camera apertures and used long exposures to capture images of the stars, the Milky Way, and occasional celestial phenomena such as comets.¹⁵ Photographers occasionally captured nocturnal images, as when the German architect Erich Mendelsohn traveled to the United States in the 1920s and documented the dramatic effects of a lighted Times Square at night in addition to his interest in the buildings of Manhattan and the architecture of the New World.¹⁶ Photography thus complemented the successful nineteenth-century literary genre of guidebooks that promised the secrets to discovering the pleasures of a nocturnal Paris. By the early 1930s, thanks to new photographic technologies including portable flashbulbs, Brassai and others increasingly turned to the nocturnal streets as the subject of imagery later published by *Minotaure*.

Brassai's book-length photo essay *Paris de nuit* (1932) led the way for new approaches to documenting the city and to nocturnal photography.¹⁷ Published in 1932, *Paris de nuit* engaged readers in new ways that were indebted to the book's subject matter, photographic technique, and page layout. In these ways, and in its emphasis on nocturnal photography, Brassai's book stands apart from other books of the time that documented Paris photographically. *Paris de nuit* distinguished itself from contemporary books by photographers Germaine Krull (published in 1928), Atget (1930), and André Kertész (1934), for instance.¹⁸ Despite the presence of an introductory essay by Paul Morand, Brassai's book was designed with no need for verbal commentary. *Paris de nuit* is an extended photo essay that puts the reader in the place of the nocturnal *flâneur*, in the sense elaborated long before by Baudelaire, one who wanders the streets of Paris training an observant gaze on whatever his transit reveals wandering the streets of Paris. Eschewing the "word-and-image" traditions of illustration and photojournalism, imagery shares space with typographic print only on the book's cover displaying a photograph of the paving-stone streets of old Paris. Through this image, Brassai and his reader set off into the past, into a city that antedated the twentieth-century moment when traditional street pavers began to be replaced by modern asphalt and the "macadamization" of Paris. Brassai puts the reader in the photographer's place, behind the lens, as he wanders the streets of Paris by night. A distinct spiral binding

allowed readers to open the book in such a way that the pictures, printed full page and without border, laid flat. A reader could turn pages easily as if moving from one site to the next, following Brassai's nocturnal trajectory. The reader became a traveler on the streets of Paris by night, a nocturnal *flâneur* who witnessed the beauty of empty locales and the varied activity—sometimes silent, sometimes bustling—of bars, dance halls, brothels, and restaurants.

Minotaure, a literary and artistic magazine, produced on high-quality paper and published quarterly, featured Brassai's night photographs prominently in issue number seven. Its French title, "Le côté nocturne de la nature" (The dark side of nature), encourages a reading of this issue as a dark antithesis to the hallowed science journal *La Nature*. Brassai's photos share *Minotaure's* pages with imagery by Man Ray and Hans Bellmer, among others. Essays in this issue included Roger Caillois's dark study of mimeticism, Jacques Delamain's writings on owls and night birds, and André Breton's "Night of the Sunflower," in addition to other works with nocturnal themes. Brassai's photos appeared prominently in two two-page spreads in this issue. Pataphysician René Daumal translated two short poetic essays from an author known solely as "Young," whose "Nights" served as the apparent vehicle for publishing many of Brassai's images. Young's "La vie est trop courte (Première nuit d'Young)" (Life is all too short [Young's first night]) opened with a solarized image of fireworks, poetically retitled *Le bouquet*, followed by photographs of moths by Le Charles, and a run of scenes from Brassai's nighttime Paris (a two-page spread of four images each, followed by five full-page photos and a half-page photograph). Though not listed in the contents, this issue's final artistic contribution is a short text with three Brassai photographs, titled "Paris Has Seven Hills, Too; Where Are They in the Night?" A photo of the illuminated quays of the Seine fills one page, while two gargoyles overlooking the night city fill the other. The brief poetic text is suffused with night.

The day has not yet received from Man the privilege of the eclipse, this
power that the night has to illuminate itself with an electric day
Beneath the projector the secrets of the night reveal themselves in
somersaults, they have the gravity of panicked acts, the value of
fragrant delight, the graces of slow movement
The light domesticates the night, captures sleeping landscapes and
living books.

Night, for the Surrealists, presented itself as a theme suitable for further poetic and artistic investigation long before Duchamp's designs for the 1938 exhibition. Surrealism felt at home in a nocturnal environment.

Critics and journalists reporting on the Surrealists' 1938 exhibition highlighted three elements in addition to discussing the Surrealist movement as a whole or commenting on individual works on display. Those three elements—fashionable guests, a scene of spectacle, and a summary relationship drawn between this and other exhibits—compressed the conceptual distance separating Surrealism from the Palais de la découverte circa 1937. Georges Cogniot's review of the opening referred to the "elegant crowd" in attendance; a critic adopting the pseudonym "le Grincheux Jovial" (the jolly curmudgeon) commented on the presence of "too many tuxedos and evening dresses for Surrealism not to take on a fashionable tinge."¹⁹ These have become the standard accounts of Surrealism's fashionable qualities circa 1938. Such eyewitness reports appear to be borne out by the photographs taken on the exhibition's opening night. Yet, the figures in these photos mostly reinforce the mores of dress of their time, an era in which one would "dress" for a night out, especially for a major event. Public memories of the Surrealists' opening night may have aligned with recollections of evening events during the previous year, such as the opening ceremonies and special nocturnal offerings of the 1937 exposition. As with most world's fairs, the exposition of 1937 had its share of distinguished visitors who were celebrated with public ceremonies.

Calling attention to the apparent disorder of the Surrealist exhibit, a cartoonist who signed himself "Isaev" punningly juxtaposed the show with the Salon des arts ménagers.²⁰ Titled "Au Salon des surréalistes," his image caricatured recognizable artworks (including Duchamp's *Rotative démisphère* in the foreground center), many of which had apparently come to life, arrayed in a scene of disorder. "Surely you are mistaken," reads the caption, "this is the Salon of the arts . . . that have moved out (Salon des arts . . . *déménagés*)." Although this has been translated as "the salon of the deranged," which is consistent with the cartoon's tone and visual imagery, translation loses the subtlety and multiplicity of the pun's reference points. In this sense, "déménagés" situates this as a scene in which a renter has moved on, leaving behind a mess (and perhaps "skipping out" on the rent).²¹ The cartoon's disorder playfully engages the Salon des arts ménagers and its attempts at shaping taste through a subsection called Exposition sur l'habitation, organized by Paul Breton beginning in 1934 and continuing

in 1938.²² Another critic aligned the Surrealists with contemporary displays in a Parisian museum dedicated to scientific education, the Musée Dupuytren. Located on the Left Bank in Paris, the museum prominently displayed scientific specimens—notably featuring specimens of teratology and samples of developmental abnormalities—in a manner that simultaneously appealed to the edification of those studying medicine and the human sciences as well as the prurient titillation of average visitors. In 1937, the Musée Dupuytren went before public scrutiny while also disappearing into memory. Public viewing of the collections went into a thirty-year hiatus that year, when the specimens were put into storage on the orders of the museum’s keeper, professor of pathological anatomy Gustave Roussy, who deemed their display in the refectory of the Couvent des Cordeliers to be unsafe.²³ Like the Conservatoire national des arts et métiers, where modern machinery filled the deconsecrated chapel, the Musée Dupuytren embodied the republican ideals of the French Revolution, celebrating modern science within formerly sacred spaces of the Catholic Church. With these points of reference, the critics situated the Surrealists alongside the fashionable accessories of modern life and the curiosities of modern science. Such comparisons aligned the Surrealist exhibition with the 1937 exposition and its celebration of science through the most talked-about science museum of the day, the Palais de la découverte.

Like the Surrealist exhibition and the Musée Dupuytren, the Palais de la découverte earned its reputation as a site of spectacle. The interior spaces of the palais offered a dynamic *mise-en-scène*, akin to a stage set, amidst which scientists presented experiments for an awaiting public. Rationally conceived, the interior of the Palais de la découverte was divided into sections and rooms, each dedicated to a different aspect of the practice of contemporary scientific thought and experiment. In a parallel way, the Surrealist exposition was divided into zones that each played a distinct role in the exhibition design’s engagement with earth and sky.

Although scholars have frequently noted the “haut bourgeois,” “tony,” “chic,” and “upscale” qualities of the Galerie Beaux-Arts, Paris, where the 1938 Exposition internationale du surréalisme was held, little attention has been given to the geographical site the gallery occupied. Scholars have made much of the fashionable location of the Galerie Beaux-Arts, situated in the eighth arrondissement of Paris at 140, rue du Faubourg Saint-Honoré. Georges Wildenstein, editor of the esteemed *Gazette des Beaux-Arts* from 1928 to 1963, founded and ran the Galerie Beaux-Arts. Acknowledging

evening of performances in the May 26, 1920, Soirée Dada.²⁴ Nearby, one could view Picabia's collaborative collage artwork *L'œil cacodylate* (1921), a touchstone of Paris Dada, at the jazz-infused cabaret-brasserie *Bœuf sur le Toit*.²⁵ Wildenstein's Galerie Beaux-Arts was located less than a kilometer from the site of the Palais de la découverte and its planetarium on the grounds of the 1937 World's Fair. Thus, the gallery's location positioned it at the intersections of the *haute bourgeoisie*, the masses, the avant-garde, popular scientific education, and the sense of spectacle all of these shared with the fair. On opening night at the exhibit in Wildenstein's gallery in January 1938, guests experienced a playful Surrealist inversion of the 1937 Exposition internationale and, specifically, its Palais de la découverte.

Enigmarelle, Electricity, and Dr. Frankenstein in Paris

Invitations to the January 17, 1938, opening of the Exposition internationale du surréalisme promised a host of engaging events and displays (figure 5.6). The listings themselves formed a curious poetry. In addition to naming the “rainy taxi” and “most beautiful streets of Paris” encountered as a part of the exhibit, the announcement detailed a sequence of performances by Héléne Vanel that was unique to the opening-night festivities. At the center of the invitation, a large captioned photograph showed uniformed officers escorting “the authentic descendant of Frankenstein, ‘Enigmarelle,’ built in 1900 by the American engineer [Frederick] Ireland.”

The invitation's captioned photo asserted that the automaton Enigmarelle would make an appearance after midnight to walk across the room



5.6. Unknown artist, invitation to the opening of the Exposition internationale du surréalisme, Galerie Beaux-Arts, Paris, January 17, 1938.

of the Surrealist exposition “in false flesh and false bones.” The figure of Enigmarelle in the invitation photograph wears a perpetually smiling expression and a wig of long curly hair. Enigmarelle’s image stands out awkwardly, to such a degree that a recipient might have guessed the automaton was a hoax, or the picture on the invitation, a bit of photographic fakery. Yet Enigmarelle was a documented curiosity of the early twentieth century, as Duchamp and the Surrealists may have recognized. He appeared, for instance, in *Scientific American* on January 13, 1906. As the magazine reported, “An interesting, novel, and pseudo-scientific attraction has recently been entertaining London audiences at the Hippodrome variety theater. This is a cleverly constructed figure which apparently walks and writes automatically. It is called ‘Enigmarelle,’ and is seemingly a mechanical and electrical combination. The figure stands exactly six feet in height, weighs 198 pounds, and is composed of 365 distinct and separate parts.” Previewing the Surrealists’ exhibit before its opening, the Parisian newspaper *Le Figaro* reprinted the text from the invitation and focused attention on Enigmarelle as “the highlight of the show.”²⁶

Enigmarelle’s significance for the Surrealists may be explained by the Frankenstein connection to which the invitation refers by calling the automaton *le descendant authentique de Frankenstein*. Dr. Frankenstein and his monster joins the “clou” of the Surrealists’ exposition with that of the Palais de la découverte, the spark-generating towers of the immense Van der Graaf generator found at the entry to the new museum of science. The promise of reviving Enigmarelle depended on the powers of electricity that were central to the 1937 World’s Fair.

Although previous world’s fairs celebrated the newly harnessed powers of electricity through pavilions and palaces dedicated to electricity, in 1937 there was no dedicated Palais de l’électricité. Instead, electricity was ubiquitous throughout the fair. Edmond Labbé, commissioner of the 1937 fair, reported that one found electricity and its applications throughout the fair:

At every entry way, thanks to photoelectric eyes, Electricity counted the number of visitors. It was she (Electricity) who powered the vehicles destined to transport visitors; certainly she who, as night fell, contributed to give an ever-changing appearance to the fair through the play of light associated with dancing waters and the lines of the architecture; at the Palace of Light [*Palais de la Lumière*], the effort required for the electrical team of the entire country was placed on display, and the rural center

demonstrated all the comforts and well-being that electricity brings to our agricultural populations.²⁷

Duchamp's original plans for the 1938 Surrealist exhibit sought to incorporate photoelectric eyes into the exhibition design. Because of technical difficulties and financial concerns, this aspect of the design was never realized. By incorporating electric eyes into the Surrealist space, Duchamp would have increased the exhibition's interactive qualities in the most technologically up-to-date ways imaginable. This technology was so acclaimed by the organizers and journalists who wrote about the 1937 exposition that a Surrealist use of photoelectric eyes in the following year would have increased the likelihood that their display would be seen as a rejoinder to the national celebration.

One of the most celebrated artistic accomplishments of the fair was Raoul Dufy's monumental painting celebrating the discovery and uses of electricity, *La fée électricité* (1937). With Labbé's personification of electricity and Dufy's *La fée électricité*, the continued dependence upon literary tropes such as allegory and personification points to the continuing challenges faced by those who sought to represent the invisible force of electricity for popular audiences in 1937. Dufy employed a new system to paint individual panels that would cohere as an enormous mural. Additionally, he painted with new paint technologies that gave his colors a degree of fluidity previously unimagined. Beyond these modern techniques, however, the content of his painting was decidedly modern. By contrast, the world's fair offered the spectacle of electricity through lights and other modern technologies.

Nowhere was raw electricity presented as boldly as in the entry to the Palais de la découverte, where one could see electricity in the making (figure 5.7). In the immense entryway of the palais, two brightly colored red pylons of insulated Bakelite plastic rose up from the floor to elevate a pair of enormous metallic spheres to a total height of fourteen meters.²⁸ This large electrostatic generator or "Van der Graaf generator," as such scientific machines have come to be known, was devised to generate static electricity on a tremendously large scale. The energy resulting from the generation of friction produced sparks that leapt across a four-meter-long gap separating the globes. Conceived and realized by French physicists André Lazard with Irène and Frédéric Joliot-Curie, this "grand générateur électrostatique" produced a spark some twelve feet long that was referred to fittingly as a "lightning bolt."²⁹ One author, reviewing "Science at the Exposition" for



5.7. Colossal pylons of the Van der Graaf generator in the entry of the Palais de la découverte, Paris, 1937. Pierre Girieud's allegorical mural *Astronomy* (1937) would have been visible above the uppermost deck of the palais, between the two electrostatic globes. Photo credit: © Palais de la découverte.

the mainstream illustrated press in May 1937, was clearly captivated by the spectacle of the fair. Discussing the goals that the palais offer “a living lesson,” in which experiments and demonstrations performed before a visitor’s eyes gave them the feeling of participating in the act of discovery, the author concluded that, “in this regard, nothing could be more expressive of the mysterious power that rules over a good part of the activity of the modern world than the electrostatic machine.”³⁰

Between the two spheres charged with high-tension static electricity, is produced a truly giant arc. At the instant the lightning bolt is created, the tension is on the order of five million volts. At the moment the spectacle seems to bring back a sense of phantasmagoria, that is when, this artificial thunder having struck, the public sees *a living being* emerge from each of these electrically charged balls. It might seem to be the illusion of a new Robert-Houdin, yet the viewer has simply witnessed the external verification of a certain number of the elementary laws of physics.³¹

This popular account unites the spectacle of science with the haunting performances of phantasmagoria. The description of “living beings” emerging from the generator’s artificial lightning is striking. For those who had seen the recent European releases of the Hollywood film *Frankenstein*, with its memorable stage set of the doctor’s laboratory, the parallels would have been clear.³² To bring the monster to life, the doctor raised an experimental table through the roof of his laboratory to attract the lightning of a storm outside. Loud rumblings and sparkings of machinery dominate the soundtrack during the laboratory scenes in the films, lending a powerful sonic element to the suspense of the doctor’s quest to reanimate beings or create life. *Frankenstein* was not the only point of cinematic reference at the time, however. Writing in *Paris-Soir* on April 28, 1937, another author compared the spectacle at the palais to German Expressionist cinema with reference to *The Cabinet of Doctor Caligari* and *Metropolis*.³³ Both *Frankenstein* and *Metropolis* employed elaborate machinery to harness the power of electricity and bring inert bodies to life (Dr. Frankenstein’s monster, or the scientist Rotwang’s “false” Maria). Through the Surrealists’ promise to revive “Frankenstein’s descendant Enigmarelle” for their nocturnal opening, they connected their playful science obliquely with the ongoing spectacle of electrostatic demonstrations at the Palais de la découverte and in popular cinematic culture.

Indoor Lightning, Meteorological Science, and a *Rainy Taxi*

To enter the Palais de la découverte between 1937 and 1942 was to breach a space of dramatic spectacle and ever-changing light.³⁴ “The spectacle is extraordinary,” noted a guidebook.

Upon crossing the threshold one is seized to the very entrails by the mysterious atmosphere in the rotunda where the electrostatic machine is installed. In half-darkness, a sky veiled in blue-green, the strange reflections of the spheres, all come together to create a strange atmosphere, a glowing glaucous light akin to that inside an aquarium or an undersea cavern. As soon as sparks begin to fly, the tones change and the museum’s dome takes on the appearance of a stormy night, illuminated intermittently. Those who are philosophically inclined might retrace the steps of time to evoke our earliest ancestors, frightened in the presence of lightning flashes; our fathers inventing the lightning rod; and these men of today in their own way creating lightning itself. All that is required is for someone to take hold of the control console to unleash this fury.³⁵

Lightning generation occurred on schedule throughout the day, with appropriate breaks allocated for lunch. A lone scientist presided over the event, controlling the display from a raised dais in such a way that his performance invited comparison with officiating priest and orchestral conductor. The production of lightning, accompanied by related scientific experiments, monologues, and demonstrations, was scheduled to occur every thirty minutes from 9:30 a.m. through noon and from 2:30 p.m. until 7:00 p.m. From the point of entry it was clear that this museum melded science with spectacle.

The Palais de la découverte achieved its mission of delivering up-to-date scientific research to broad popular audiences by encouraging a mix of on-site research, dissemination, and display. Cinema and art worked alongside research scientists to promote an integration of contemporary modes of intellectual inquiry. More than any museum before, the palais was designed to offer an experience that was multisensory. Displays were designed with new approaches to the presentation of data, information design that could promote new forms of education. Even the architecture was conceived as an aid to educating varied audiences. Nowhere was this more obvious than in the circle-shaped room dedicated to the mathematical concept of pi.

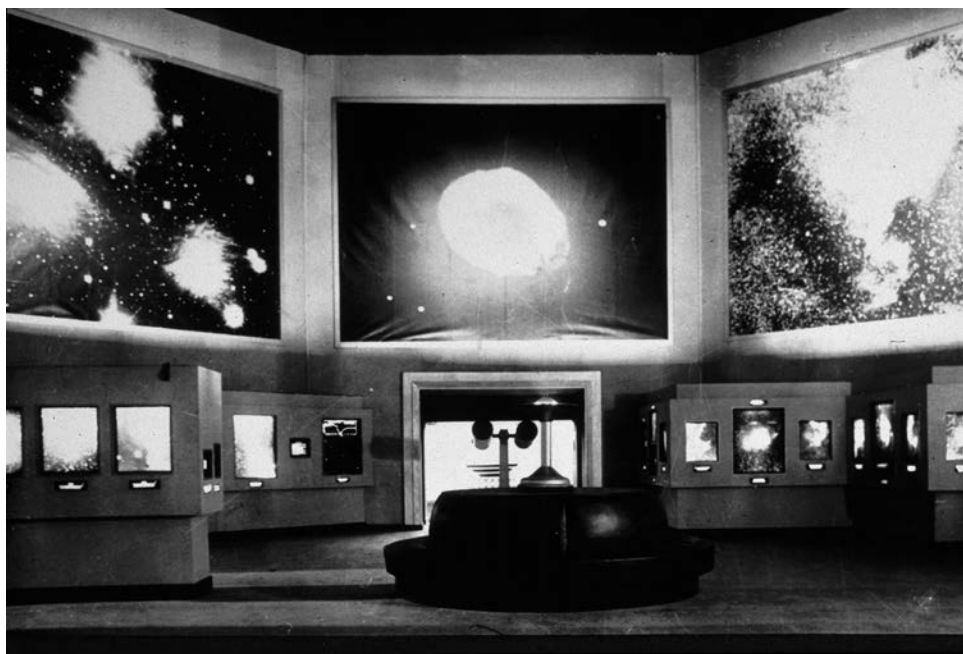


5.8. Meteorology section in the Palais de la découverte, Paris, 1937. Photo credit: © Palais de la découverte.

Approximately equal to 3.14159, the number's value was registered to 707 digits shown in painted wood typeforms that spiral around the ceiling of the museum's "Pi Room." Here, architecture worked to aid visualization and conceptualization. At other times, spectacle provided the primary impact of the palais.

Upon entering the palais, visitors immediately encountered the towering immensity of the electrostatic generator. Its size was proof of its power, as a popular guidebook to the fair noted: "This machine, the largest electrostatic generator in the world, produces the world's largest spark."³⁶ Such a spectacular spark could readily be conflated with a lightning bolt, especially given that the word *étincelle* refers to both phenomena. A visitor moving past the Bakelite pylons could see grand staircases sweeping from the ground floor upward to sections of Astronomy and of Optics, marked with distinct lettering (figure 5.4, plate 17). Beneath the Astronomy balcony, visitors continuing on the ground level entered an area focused on physical geography and meteorology bathed in a blue nocturnal light from the zone of Astronomy above (figure 5.8). Nearby, one could hear the disembodied voice of the Speaking Clock of the Paris Observatory before passing through this seminocturnal zone to encounter demonstrations and explanations of cloud forms, weather patterns, seismic disturbances, and the history of meteorology itself.³⁷

Astronomy was celebrated by popular guidebooks as one of the most successful aspects of the palais.³⁸ The "Grand Stairway of Astronomy"



5.9. Hall of the Stellar Universe in the Palais de la découverte, Paris, 1937.

Photo credit: © Palais de la découverte.

(shown in figure 5.4, plate 17) was one of seven divisions within the original astronomy section of the palais. The other divisions were dedicated to the stellar universe; sun; moon; planets; comets and meteorites; and, finally, observatories and instruments. Labels within the astronomy division reminded visitors that, “if science in general knows no frontiers, it is all the more true of astronomy, whose object of study is so unrelated to the boundaries that man has established on his planet,” for astronomers and observatories from eighteen different countries contributed photographic documentation to the exhibition.³⁹

Especially in the Hall of the Stellar Universe, the resulting array of films and photography transformed the darkened exhibition space into a viewing platform from which to experience the mysteries of the cosmos. In the Hall of the Stellar Universe, the architectural firm of Bouterin, Debré, and Néret that designed the palais anticipated science fiction visions by creating a room as if it were a prototype for the bridge of a tremendous intergalactic vessel (figure 5.9).⁴⁰ Large-scale six-by-four-meter photographs dominated the room above, with smaller photographs displayed in lightboxes

below. Ultraviolet light illuminated fluorescent models illustrating ancient cosmologies and current understanding of the spiral galaxies, although it is unclear whether these were a part of the museum in 1937 or added later. The Milky Way, bright and dark nebulae, and spiral galaxies numbered among the topics treated in this hall.

Nearby, in the Hall of the Moon, stood a one-millionth scale relief model of the moon, copied from the original in the Uccle Observatory in Belgium (figure 5.10). A section about comets used models and photographs to educate visitors about these errant stars (figure 5.11). Even the Earth was analyzed in the palais, with a globe presenting up-to-date geographical knowledge in addition to the scale models showing all the planets of



5.10. Scientific demonstration presented in the Hall of the Moon in the Palais de la découverte, Paris, 1937. Photo credit: © Palais de la découverte.



5.11. Hall of Comets in the Palais de la découverte, Paris, 1937. Photo credit: © Palais de la découverte.

our solar system. Astronomy and geography took their place alongside the many sciences represented.

Visitors entering the Palais de la découverte or the Surrealist exhibition in early 1938 encountered multiple references to the sciences, especially those of astronomy and meteorology, in both locales. Passing the artificial lightning bolts of the electrostatic generator, guests at the Palais de la découverte moved next to the sections of the science museum that dealt with meteorology and physical geography. Upon entry to the Wildenstein gallery at the door marked 140 rue du Faubourg Saint-Honoré, guests moved through an interior passageway until they reached a courtyard.⁴¹ There they encountered Salvador Dalí's *Rainy Taxi*, parked in the courtyard separating the entry passage from the gallery entrance.

Despite the many references to *Rainy Taxi* being situated in the courtyard, few point out that this would have been the first aspect of the exhibit one encountered. Yet the journey from the street had begun long before. A visitor's spatial experience would have begun on the street. At the street, one would presumably ring for the exterior doorway to be opened, allowing access to a interior corridor. After snaking through this liminal space, one would eventually access an exterior courtyard located within the building complex (the site of Dalí's *Rainy Taxi*) before encountering a final, formal, gallery entryway.

On opening night, early arrivals gathered around the taxi to await Breton's signal that the gallery doors be unlocked at 10:00 p.m.⁴² Dalí's work turned viewer's expectations about the weather upside down, because a simulated "rain" fell within the taxi rather than outside it. Outside, the taxi's headlights gleamed into the dark of the night, while inside the vehicle water dripped or sprayed from tubes installed by Dalí. The water rained upon two female mannequins, one wearing a wig of light-colored hair and the other adorned with driving goggles and wearing a shark's toothy jaws. Vines of ivy wove in, out, and around the car, sustained by the water of the internal rains. A population of edible snails that had been imported from Burgundy to inhabit the taxi also enjoyed the taxi's rain.

Passing through the doors into Wildenstein's gallery, visitors entered a darkened space that they were invited to navigate with lighted Mazda lamps in hand. Like the strange lighting of the Palais de la découverte, this disconcerting darkness marked a visitor's experience from the start and was noted by many of the critical and journalistic accounts of the opening. As guests moved through distinct zones within the exhibition space, they entered a

variety of environments the invitation had warned them about. They encountered simulated and created landscapes evoking the city of Paris, with its recognizable street signs and marshy terrain.

The inverse meteorology of Dalí's *Rainy Taxi* was echoed by Wolfgang Paalen's sculpture *Articulated Cloud (Nuage articulée)* exhibited inside the gallery. Paalen's "cloud" was an assemblage made from an opened umbrella, covered with sponges. Its tactile and associative qualities could readily have rivaled those of another, better-known work exhibited alongside it, Meret Oppenheim's fur-covered cup and saucer titled *Object (Déjeuner en fourrure)*. Both Paalen's and Oppenheim's works transform utilitarian objects into useless ones as they juxtapose wetness with dryness, and hardness with softness. Imagine carrying Paalen's *Articulated Cloud* during a rain shower. Gradually its exterior sponges would absorb water, until the collected rains poured off the edges of the umbrella, perhaps infiltrating the interior sponges and eventually watering the user. Alternately, if its sponges were soaked with water, it would make it possible for its carrier to be accompanied by her or his own portable rainstorm on the driest of days. Like Dalí's *Rainy Taxi*, Paalen's *Articulated Cloud* offered an alternative, and inverted, meteorology. Duchamp later returned to a meteorological theme with the *Rain Room* he designed for the 1947 Surrealist exhibition. In the exposition of 1938, playful weather was one form of commentary on the nearby Palais de la découverte with its rooms dedicated to meteorology.

Across the Coal Sacks: Journeys through the Milky Way

Duchamp's contribution of a ceiling filled with coal sacks to the exhibition design expanded that dialogue to be a cosmic one. Duchamp's design engaged with the presentation of astronomy at the palais and at the accompanying attractions of the planetarium and Stellarium, two attractions that offered immersive forms of popular science. Although these attractions have been largely forgotten today, Duchamp's exhibition design built upon their immersive qualities and their cosmic content in ways that have not been explored previously.

Although the immersive elements of Duchamp's exhibition designs were anticipated by the printed invitation to the opening of the 1938 exhibit, the invitation also points to a late change in Duchamp's plans (figure 5.6). If the ephemeral invitation is a dependable indicator, the coal sacks were a late addition to the exhibition. The invitation signaled that Duchamp had already

conceived new approaches to the transformation of an exhibition space into a site of immersive experience. The invitation referred to *roussettes*, a term that can translate as “umbrellas” or denote a species of fruit bats. *Roussette* bats would have been visible in the displays of the new Parc Zoologique de Vincennes or the Muséum d’Histoire Naturel in the Jardin des Plantes, lending other Parisian points of reference to the original concept. To embrace the pun of two matched words was standard fare for Duchamp, whose advertised ceiling of bats would puzzle those visitors who found, instead, *roussette* umbrellas. Duchamp later employed the *roussette*-ceiling concept in his design for a shop window promoting Denis de Rougemont’s book *La part du diable* (*The Devil’s Share*).⁴³ Bats would have complemented the nocturnal qualities of the exhibit. In the context of the 1938 exhibition’s interest in meteorology, the umbrellas would have held their own logic. By shifting from umbrellas to coal sacks, however, Duchamp shifted the stage from terrestrial to celestial geographies.

On Earth, coal sacks were as pedestrian an item as one might find in 1938. Although coal heating was on its way out, Parisians used charcoal for heating and, especially, cooking. Lead-lined bags of coal were readily available at the corner market. Charbons Breton was one charcoal producer of the time, with prominent sales points across Paris and throughout the nation. In the years before World War II, the Charbons Breton factory could be seen sprawling on the banks of the Seine at 60, Quai de la Rapée, not far from the Gare de Lyon train station. “Vous ne serez pas trompés” (You won’t be fooled or, You won’t be swindled), touted the Breton company’s interwar advertising, assuring customers of the quality of their coal (figure 5.12). In one such image, a Pinocchio-like figure offers coal whose superior quality and authenticity are guaranteed by the marks on the bags. For an exhibition organized by A. Breton, the brand association with commercial coal would have lent a complex visual-verbal pun to the overwhelming presence of 1,200 coal sacks on the ceiling. Like his readymades, Duchamp’s coal sacks were punning acts of substitution. In the exhibit’s nocturnal setting, the sacks substituted for the dark skies above and for a specific dark corner of the Milky Way, the Coal Sack nebula.

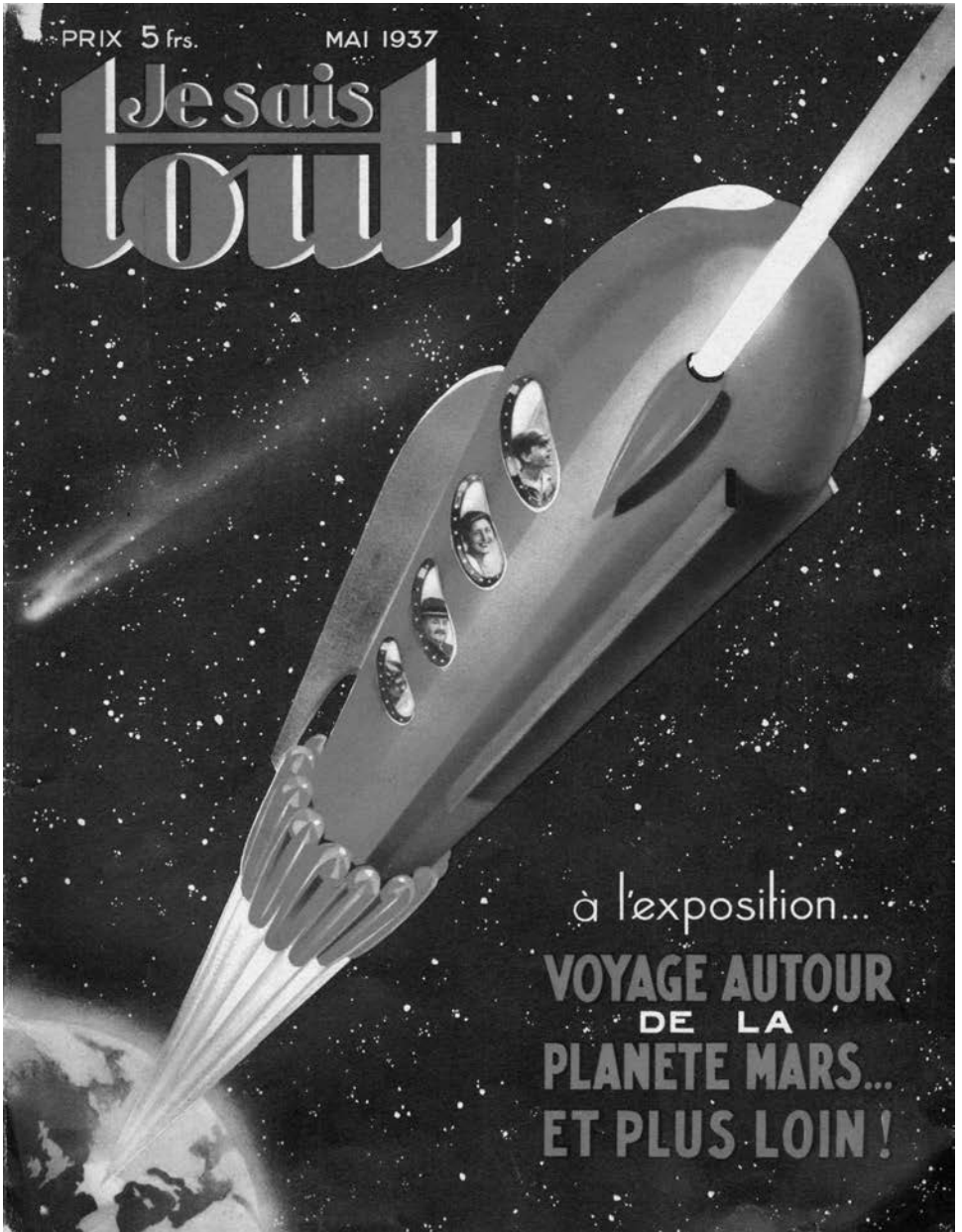
Astronomers had long identified the coal sacks as a sign of the complexity of the Milky Way. Early cosmologies, like that of Aristotle, had asserted that the Milky Way was formed by an “exhalation” from the Earth or stars into the upper atmospheres where it was ignited by the motion of the celestial sphere. Galileo’s telescope helped him to see that the Milky Way



5.12. Unidentified artist, Charbons Breton advertisement, ca. 1925. Collection of the author.

was a congregation of stars; the milkiness was a matter of appearances, of stars observed by the unassisted eye. These and related historical lessons about astronomy and cosmology were promoted by didactic panels at the palais. Nineteenth- and early twentieth-century skywatchers viewed the Coal Sacks as something mysterious, a dark absence of the stars that otherwise proliferated across the Milky Way. For visitors to the palais, large-scale photographs of the Milky Way made such mysteries knowable like never before. One enormous photographic print of the Milky Way measured 4.5 meters tall and 21 meters long, making it easier for a visitor's naked eye to distinguish individual stars than it had been for Galileo staring through the lens of his Renaissance-era telescope.

Not only were the Coal Sacks distant, but also they were unobservable from the northern hemisphere and therefore exotic. Before 1937 Parisians who had never traveled south of the equator could only know them



5.13. Charles Gamain's "Stellarium" or "Interstellar Rocket," constructed for the scientific attractions area of the Exposition internationale des arts et techniques dans la vie moderne, Cours Albert-Premier, Paris, 1937. *Je Sais Tout*, May 1937. Collection of the author.

vicariously, from readings in Flammarion and similar sources. Thanks to the Paris planetarium's programming, Europeans could visit the southern hemisphere virtually. The popular illustrated magazine *Je Sais Tout* celebrated this while recounting the planetarium's immersive voyage: "Now, we pass into the southern hemisphere. Here, in the sky above the Cape of Good Hope, the most resplendent of celestial jewels: the Southern Cross."⁴⁴ Traveling into the Southern Cross to see the Coal Sacks, one might traverse the Milky Way to witness at close range how distinctly their darkness contrasted with that of the milky proliferation of stars. The popular science author Roger Simonet celebrated the new planetarium, and the question its virtual journey would raise: "Imagine yourself transported a great distance [toward the constellation Perseus], looking at the solar system, what do you see?"⁴⁵ Although the planetarium's darkened interior could become transporting and immersive through the narratives its astronomers delivered, the sensory triggers for this experience were primarily visual and, secondarily, aural. By contrast, another attraction at the fair proposed an experience that would engage more of the senses while convincingly transporting visitors on an intergalactic voyage. Called the Stellarium, this was the creation of Charles Gamain, an engineer and lighting designer (figure 5.13, plate 18).⁴⁶

Writing for an audience of schoolteachers, popular science author Gabriel Eisenmenger contrasted the planetarium to the Stellarium, with its "cosmic rocket and interplanetary voyage." "To see the sky and witness the phenomena produced there is good, even very good. But to go to the skies . . . and return to tell the tale, that's certainly far better."⁴⁷ Thanks to the efforts of astronomer Robert Lencement, visitors to the exposition could see a room dedicated to the history of rocketry at the Palais de la découverte. In the Stellarium, one climbed inside a "rocket" to experience a simulated journey, fulfilling science fiction fantasies of those who knew of such things from illustrated novels of Verne, films of Georges Méliès, or the more recent imagery of Buck Rogers.

Science fiction provided multiple points of inspiration for the Stellarium, beginning with the name of the attraction. The book *Les navigateurs de l'infini* (Navigators of infinity), published in Paris in 1925, recounts the adventures of astronauts who traveled to Mars in a vessel named *Stellarium*.⁴⁸ Eisenmenger continued his enthusiastic description of the Stellarium at the exposition of 1937, writing,

It is now possible to give the illusion of an interstellar voyage. One begins by creating a special, tangible, ambiance that allows the audience to participate in the experience of an astronaut by communicating the sensations, scientifically observed, of a true voyage into space. We know that it is technically possible to create a rocket ship capable of completing the voyage from the earth to the moon. For the Exposition, the special vehicle has been built at full scale [60 x 16 meters]. . . . Inside, the public will rejoice at the spectacles that would appear before their ecstatic eyes if they were to leave our terrestrial globe to rocket at terrific speeds towards Mars, Saturn, across the Milky Way, and back. . . .

Curiously illuminated embarcadero; interstellar rockets lined up and ready to depart; personnel of the “Interstellar Corporation”; passengers seated; hermetic closure of the rocket; the slow lowering of the rocket into its launch mechanism; blast off, into the stratosphere without the slightest hitch. The marvelous voyage has begun!⁴⁹

Eisenmenger and Simonet in their descriptions of the Stellarium make no attempt to conceal their enthusiasm. Passengers on the Stellarium peered out from portholes (*hublots*) to witness planets and other celestial forms they “passed” in their virtual travels, echoing exhibition designs in the astronomy section of the palais in which they viewed models, photos, or dioramas through round portholes.

Because little is known of the Stellarium and its history, consider how this eyewitness report permits a partial reconstruction of the experience offered by this scientific attraction.

The pilot explains that successive discharges of a mixture of liquid hydrogen and oxygen will allow the ship to progressively increase speed; already the speedometer’s needle shows we have exceeded 10,000 km per second. Through the windows we see a prodigious vision of myriads of stars. . . . Our speed has now reached 100,000 kilometers per second and at this breakneck pace, the “landscape” moves slowly. Now we see a bright-glowing globe that gradually grows, and the pilot announced that the rocket is heading to Mars: we soon recognize the canals that the photography has made known to us and, at 80,000 kilometers from the planet, we circle Mars and then go spinning on to Jupiter. The speed is now 250,000 kilometers per second. The star appears soon with its satellites, which allows us to complete our knowledge of this monstrous

planet, nearly 1,300 times larger than the Earth, and whose rapid rotation creates a considerable flattening effect.

With a new maneuver from the pilot, our speed increases again and the rocket is pointing towards Neptune, the most distant of all the known planets. Having now achieved a speed greater than the speed of light, we witness the curious phenomenon of the color variations of stars. Without difficulty we cross the imponderable “hair” [*chevelure*] of a comet, which will stretch for several million kilometers. And here are the *nebulae*, which are all separate universes and which are formed by billions of stars. We now reach the limits of our Universe; turning back, the pilot recognizes one yellow star among many others: it is our Sun, illuminating the tiny speck of dust, still invisible from this distance, which is the Earth. . . .

The inventor of this fantastic and scientifically proven attraction is a French engineer, Monsieur Charles GAMAIN. We must praise unreservedly this achievement, unique in all the world. This scientific journey, of great value and accessible to all, should be experienced by everyone who visits Paris for the Fair. To ascend to the heavens without the use of the cosmic rocket . . . is certainly something else altogether!⁵⁰

Narration undoubtedly played a key role in this experience. The voice of the captain, perhaps combined with a visible speedometer, convinced visitors of the Stellarium’s ever-increasing speed and trajectory. Looking through the portholes, visitors likely saw a moving panorama of celestial phenomena that corresponded to the narration. Lighting effects combined with movement and noise to convince passengers of the vessel’s passage through space.

Through this multisensory experience in the convincing space of a simulated rocket ship, visitors to the 1937 fair experienced the cosmos firsthand in ways to rival the “serious” science of the planetarium and palais. Before the age of the planetarium, the most convincing simulations of intergalactic travel were achieved through cinematic means. Perhaps the greatest success before this time had been achieved by the German filmmaker Hanns Walter Kornblum with his silent film *Wunder der Schöpfung* (1925).⁵¹ Like subsequent examples of international cinema, Kornblum’s film used a voyage through the cosmos to describe the place of humankind in the universe. Film played a decisive role in the dissemination of scientific thought at the world’s fair, even if at times it appeared to be overshadowed by more participatory attractions such as the Stellarium.

The 1937 World's Fair or Exposition internationale des arts et techniques dans la vie moderne was designed to consciously mark the tricentennial anniversary of the original publication of René Descartes's *Discourse on the Method*.⁵² First of the fair's organizing principles was "la pensée."⁵³ Meaning more than "thought" as a simple translation of the word might suggest, *la pensée* was intended to celebrate national traditions of distinctly French thought. *La pensée* pointed to a long lineage of Cartesian rationality and its heritage. *La pensée* celebrated the origins of the modern scientific method with its emphases on doubt or skepticism, experimental testing, and replicability. Duchamp embraced Descartes's doubt, while disavowing the larger impact of Cartesianism and calling himself a "defrocked Cartesian."⁵⁴ "I am not a Cartesian by pleasure," Duchamp told art historian Dore Ashton in an interview. "I happen to have been born a Cartesian. The French education is based on a sequence of strict logic. You carry it with you. I had to reject Cartesianism in a way. I don't say that you can't be both [Cartesian and non-Cartesian]. Perhaps I am."⁵⁵ If the 1937 exposition was a celebration of Descartes as a standard-bearer for modern France, then the Surrealists' response was characteristically irrational and non-Cartesian.

Valéry, a man of letters and member of the French Academy, was selected to preside over "group 1" of the exposition, coordinating those activities, events, exhibits, and pavilions associated with the theme of the "Expression de la pensée," or "Expression of Thought." Arts and sciences came together under this capacious umbrella category. The theme of scientific discovery, headed by Perrin, fell under Valéry's purview as a demonstration of thought in action. So, too, did the themes of cinema (headed by Louis Lumière, one of the French fathers of cinema), literature, museums and exhibitions, theater, music and choreography, and grand meetings and conferences (*congrès et conférences*). The propaganda surrounding this category of the exposition seemed to renew the messages of the 1931 Exposition coloniale, also held in Paris, which had been characterized by heavy-handed statements about "Greater France" and the "Civilizing Mission."⁵⁶ "To exhibit and define 'French thought' [*la 'Pensée française'*] might have seemed to defy all possibilities. The Exposition of 1937 has succeeded in this feat, in placing this group of the expression of French thought at the top of the list. France, great educator of the peoples of the Occident, inspiration for the renewal of the Orient, the one to reveal the African soul, has distrib-

uted everywhere the universal benefits of her intelligence, her balance [*son équilibre*], and her artistic taste. In this respect one could say that the 1937 Exposition has not only been l'Exposition des arts et des techniques dans la vie moderne, but also the Exposition of Civilization."⁵⁷

Valéry's goals for the expo included the celebration of pure research alongside the technical achievements of industry and, to these ends, to promote ways of representing abstract thought in concrete forms. "We will go so far as the fourth dimension, demonstrating this with the aid of models, films, and essays on non-Euclidean geometry," Valéry proclaimed when he accepted the leadership of "group 1" of the exposition. "Thanks to the collaborators Monsieur Valéry drew together around him, this seemingly impossible agenda was achieved."⁵⁸ Although Perrin was chief among those collaborators, the fourth dimension was brought to life vividly thanks to the efforts of filmmaker Jean Painlevé (1902–89), whose film on the topic was featured in the Palais de la découverte in its opening year. Duchamp's longstanding interest in the fourth dimension, and the mutual friendships he shared with the filmmaker Painlevé, might have encouraged his interest in this practical film about the visualization of an elusive concept.

Son of mathematician and statesman Paul Painlevé, he was a pioneer in the use of motion pictures to present science to mass audiences. The younger Painlevé occasionally associated with the Surrealists and other artists in Duchamp's circles. In 1925, the young Painlevé seems to have been responsible for pages of doodles and sketches pilfered from the political leaders of France that appeared in *La révolution surréaliste* (at the time, his father was prime minister of the French nation).⁵⁹ In the Surrealist journal *Documents*, Georges Bataille published Painlevé's photographs alongside those of photographer Eli Lotar, who assisted on several of Painlevé's films as cameraman and still photographer.⁶⁰

Although historian of photography Ian Walker suggests that Painlevé was a part of Bataille's "dissident" Surrealist group by the late 1920s, the filmmaker's associations reached far beyond Bataille's circles. Painlevé, whose primary contributions were as a maker of scientific films, founded the Institut de cinématographie scientifique (ICS) in 1930 to promote the scientific cinema. Through his larger cultural contacts he befriended and filmed artists. During the early 1930s Painlevé shot a series of short film sequences, perhaps "rushes" for a longer project, of sculptor Alexander Calder's mobiles in motion. Painlevé produced no larger film of Calder's art until they worked together in 1954–55. Yet the two maintained their working

relationship throughout the turbulent war years. Painlevé knew many contemporary artists from the Surrealist and other avant-garde groups. He seems to have been on good terms with them, although their association seems to have been secondary to his concerns to promote scientific cinematography. Painlevé's works were published and exhibited alongside the Surrealists for their mutual affinities. The filmmaker's photographs were shown alongside those of Man Ray in a Paris exhibit of 1935.⁶¹

In 1936, under the sponsorship of the Palais de la découverte, Painlevé collaborated with special effects master Achille-Pierre Dufour to bring the fourth dimension to life through a comprehensible short film. The result, *La quatrième dimension*, was one of four films commissioned from Painlevé that screened to capacity audiences in the inaugural year of the palais.⁶² *Le voyage dans le ciel*, another of Painlevé's films presented in the palais, promoted scientific understanding of cosmological, astronomical, and mathematical concepts while transporting visitors on a virtual journey across the cosmos. Eschewing the fascination with rockets that characterized fictional films or the fair's Stellarium attraction, with its simulated interplanetary voyage, *Voyage dans le ciel* used models like those in the astronomy section of the palais to reinforce its scientific seriousness. Thanks to elaborate (if low-tech) special effects, Painlevé's cameras transported viewers to the surface of the moon and distant planets, through the vast emptiness of space, and past the Milky Way on their ten-minute voyage. Painlevé's films brought the spatial fourth dimension to popular audiences as a case study of theoretical mathematics; by contrast, he built upon astronomical observations to present interplanetary travel as distinctly possible and made real thanks to his simulations. These and other films were projected in a special on-site cinema and also in the different sections of the museum. The section devoted to astronomy was especially rich in films. A glass projection screen in the room devoted to the sun displayed images of solar flares and the gradual stages of a total solar eclipse. During October–November 1937, the Cinémathèque de la Société astronomique de France (SAF) mounted a lively program of astronomical films accompanied by a cycle of a dozen conferences about recent astronomical discoveries.⁶³ Ernest Esclangon (1876–1954), friend of Perrin and director of the Observatory of Paris, who sought to integrate astronomy into the larger exposition as well as the palais, promoted cinema as a lively tool for presenting popular science at the palais and the larger 1937 exposition.

Scholar of French science films Florence Riou has demonstrated how

cinematic projections reinforced the goals of Perrin and physicist/academician Paul Langevin (1872-1946), who sought to make the palais a site of *living* science.⁶⁴ As Langevin proclaimed, “The history of ideas makes science come alive; that is what we should teach, rather than the embalmed science of technical results to which scientific education usually confines itself.”⁶⁵ The efforts of Perrin and Langevin to make science vital, alive, and contemporary had a dramatic positive impact on science museums of the later twentieth century that would follow the lead of the Palais de la découverte. Valéry’s involvement with science and art in his role as a leader of the 1937 exhibition brought this sense of urgency to his view of other museums that they, too, might be places of vital importance and living research. When the Musée de l’homme and the Musée des monuments français opened for the 1937 exposition, they occupied wings of the Palais de Chaillot. Outside, a poetic inscription by Valéry greeted those who visited them, testifying to the visitor’s role in determining whether they become sites of inspiration or “tombs” to preserve dead culture.

Today, those who visit the Palais de Chaillot structure built at the foot of the Eiffel Tower for the 1937 World’s Fair can still see engraved on its walls words by Valéry with which these structures were dedicated:

Passerby, you must decide
Whether I be a tomb or treasure-house
Whether I speak or remain silent
The choice is yours, my friend
Do not enter without desire

Every man creates unwittingly
As he breathes
But the artist is aware of himself creating
The creative act engages all of his being
His chosen suffering gives him strength

Within these consecrated walls
I welcome and protect the works
Of the artist’s prodigious hand
Equal and rival of his thought
One is nothing without the other⁶⁶

These words remain hidden in plain view today, arguably largely ignored by those who pass. Valéry’s words seem to invoke the notion that

5.14. Hall of the Moon in the Palais de la découverte, Paris, 1937, showing models of the craters of the moon by space artist Lucien Rudaux. Photo credit: © Palais de la découverte.



5.15. Model of a galaxy presented in the astronomy section of the Palais de la découverte, Paris, as photographed in 1952. Such low-tech models as this one (presumably made of cotton wool affixed in a spiral to a disc) characterized many of the displays in the palais from its 1937 opening until renovations in the 1990s. Despite their simple construction, many such models communicated their scientific concepts very effectively. Although this photograph was taken in 1952, the date of construction of the spiral galaxy display remains unknown—it may have been earlier. Photo credit: © Palais de la découverte.

all humans are creators and thus potential artists. Self-awareness distinguishes the artist from others. Perhaps Duchamp had Valéry's inscriptions in mind when he told interviewer Pierre Cabanne that his greatest art was breathing: "Deep down, I'm enormously lazy. I like living, breathing, better than working . . . if you wish, my art would be that of living: each second, each breath is a work which is inscribed nowhere, which is neither visual nor cerebral. It's a sort of constant euphoria."⁶⁷ When he spoke these words to Cabanne, Duchamp had long worked hard to keep up the appearances of laziness. He had worked tirelessly to create *Etant donnés* and to guard its secret until it would be unveiled posthumously.

When the world's fair closed, on November 11, 1937, the planetarium was dismantled and placed in storage beneath the Musée des arts et métiers. It existed only in memory until it was rebuilt, this time as a part of the Palais de la découverte, in 1952. Similarly, by 1942 the impressive towers of the electrostatic generator had been shipped off to a laboratory on the outskirts of Vichy Paris.

Like many of his fellow artists, Duchamp eventually left Europe under the growing political pressures of the Nazi occupation of France and the intensification of World War II. His engagement with different modes of creative production associated with "design" grew increasingly after he returned to New York. Collaborations with the Chilean painter Matta (Roberto Antonio Sebastián Matta Echaurren) and the Viennese architect Frederick Kiesler opened new opportunities for engaging with themes of earth and sky. Like the 1938 Surrealist exhibit, subsequent exhibitions of 1942 and 1947 allowed Duchamp greater latitude for exploring multisensory exhibition design. For the 1947 Surrealist exhibition, held at Aimé Maeght's gallery on the rue de Tehran in postwar Paris, Duchamp returned to the lessons of the fair and the palais for inspiration. His contributions to the exhibition included a diorama-like installation of the *Juggler of Gravity*, directly inspired by the displays in the astronomy section of the Palais de la découverte (figures 5.14 and 5.15).⁶⁸ The *Juggler* and the *Green Ray* adapted the hall's "porthole" forms and the visual idiom of its dioramas. In reengaging the subject matter and visual stimuli of the Palais de la découverte exhibition designs, perhaps Duchamp returned to what could still be salvaged of a Paris from before the Nazi occupation. Returning to themes of domesticated meteorology, as in 1938, Duchamp designed an interior *Rain Room*. While the Surrealists wrestled with myth in 1947, Duchamp turned again to playfully engage science-as-myth.⁶⁹

CONCLUSION

LANDSCAPE DEFIED, THE HEAVENS DENIED

• • • • • arcel Duchamp's engagement with traditions of landscape representation continued throughout his career. An intense return to landscape in his works of the 1950s and '60s demonstrates a more generalized approach than his earlier engagement with astronomy and geography. A series of late works including *Cols alités* (*Bedridden Hills*, 1959; figure 3.14) and *Etant donnés* (1946-66), among others, testify to this renewed engagement with landscape. Amid these late works, a little-known poster issued by Duchamp as a multiple in 1967 stands out. It functioned simultaneously as a portrait and a new kind of landscape (figure c.1, plate 19).¹ In an "ultimate" convergence of artist and site, Duchamp's poster brought together his longstanding interest in landscape with the daily political realities of the Cold War era (circa 1947-91). As such, this late work merits special consideration for its power to treat landscape in new ways. By disrupting conventions of landscape depiction, Duchamp's poster engaged with landscape on his own terms.

Duchamp created the poster for a 1967 retrospective exhibition of multiples and readymades at the Paris Galerie Claude Givaudan. By the 1960s, astronomy and geography held vastly different cultural associations than they had held five decades earlier. Although these sciences had always been entangled with the politics of their epoch, the era after World War II transformed and intensified their politicized nature. Postcolonial independence movements reshaped the politicized meanings of cartography and geography. The creation of the Soviet Bloc and the new boundaries of the Cold War led to dramatic transformations of political geography. Space became the place onto which dreams of new colonies were mapped; the Space Race transferred the political rivalries of the Cold War onto the science of astronomy.

With the cover he designed for the special "Duchamp number" of *View*

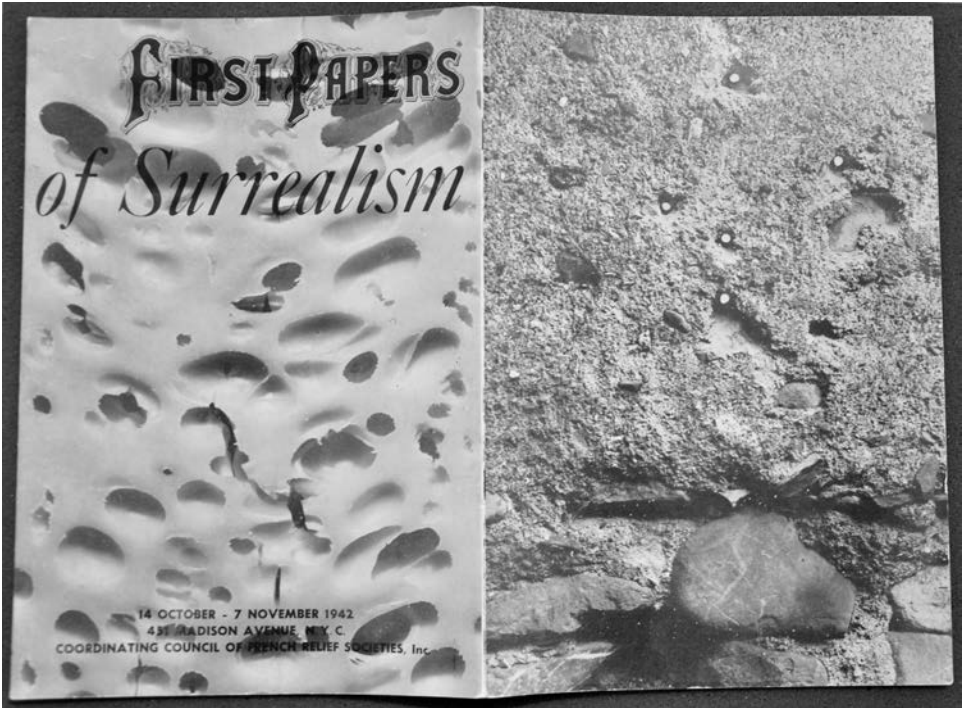


c.1. Marcel Duchamp, limited edition print made to accompany the exhibition *Ready-Mades et éditions de et sur Marcel Duchamp*, at the Galerie Claude Givaudan, Paris, June 8 to September 30, 1967. Color lithograph. 27³/₈ x 18¹⁵/₁₆ in. (69.5 x 48 cm). Private collection. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Courtesy Francis M. Naumann Fine Art, LLC.

magazine that appeared in March 1945 (discussed in the introduction), the artist may have been looking back to the longstanding engagement with astronomy, aviation, and dreams of interstellar rocket travels that this book has chronicled. He could just as well have been acknowledging, with the martial reference of the bottle's apparent label (his early twentieth-century documents of obligatory military service), that the sites of political engagement had already begun to shift away from the Earth's surface toward its atmosphere and beyond. Whether through military aviation or space flight, the battles had taken to the skies.

Duchamp and fellow Surrealist artists who had fled Europe collectively convened the "First Papers of Surrealism" exhibition with an opening on October 14, 1942. Duchamp contributed art to the exhibit; designed its catalog; and installed the works on display, "completing" them with the addition of string. The exhibition's title referred to the first step in the process by which an alien becomes an American citizen, naturalization. This two-step process took a minimum of five years. After residing in the United States for two years, an alien could file a "declaration of intent" to become a citizen; this declaration was referred to as "first papers." After three additional years of residence, the person could "petition for naturalization"; when citizenship was granted, a formal certificate of citizenship would be issued. For the Surrealist artists displaced by a war that showed no sign of ending soon, questions of "home" and citizenship were pressing. By titling the exhibition *First Papers*, they signaled their intent to bring Surrealism itself to a status as "American."

Duchamp's design for the catalog covers evoked lunar landscapes through paired photographs (figure c.2). He depicted, on front and back covers respectively, a stone wall and a piece of "Swiss" Emmental cheese. The catalog's distinct yellow-green color reinforced lunar associations; this is "green cheese" like that from which the moon was made. A reader opening the cover would notice that the photograph, showing holes shot into the barn's rocky surface, has itself been punctured with a die-cut manufacturing process. As one opens the cover, these holes cause points of light to appear on the blank interior page below (figure c.3, plate 20). This effect is akin to a planetarium show, on a very humble scale, creating a constellation that resembles the Big Dipper. Duchamp's gesture, like illustrations in the astronomy and geography books from the late nineteenth century, might have reminded wartime viewers of the most basic form of navigation: celestial navigation, beginning with the identification of the pole star. During



c.2. Marcel Duchamp, cover design for the catalog *First Papers of Surrealism*, 1942. Special Collections, University of California Library, Davis. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp.

the political turmoil of the Surrealists' New York exile, such a small gesture could perhaps be a potent reminder of the possible road back home. Yet the "constellation" should be taken with a grain of salt, if one recalls that the expression "to say that the moon is made of green cheese" refers to humorous pleasantries at best, or a hoax or swindle at worst.² Geopolitical realities in October 1942 did not make a rapid return voyage to Europe a desirable one for the Surrealists.

When Duchamp crafted the multimedia *Allégorie de genre (Portrait of George Washington)*, in 1943, as a potential cover design for *Vogue* magazine, the work addressed the politicization of the map and its territory (figure c.4). Staining gauze with iodine, he affixed the fibers to a cardboard backing with nails driven through thirteen gold stars. The stained gauze created alternating striations of white and darkness that evoked the stripes of the U.S. flag; the stars represented thirteen original states of the country,

c.3. Marcel Duchamp, design for the catalog *First Papers of Surrealism*, 1942, showing open catalog and constellation pattern formed by light passing through die-cut holes in the catalog's cover. Special Collections, University of California Library, Davis. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp.



as represented on the first national “stars and stripes” flag. Yet the gauze simultaneously held multiple forms, akin to the bi-stable image of the duck and rabbit discussed in chapter 1. In addition to evoking the flag, it clearly resembled the profile of George Washington. As the nation’s first president, Washington could substitute for the U.S. landscape; his profile and the contours of the land became one in Duchamp’s work. Iodine on gauze might have evoked a landscape of bloodshed too distinctly for wartime audiences. Duchamp would continue to manipulate his own profile in the coming decades as a subject in his art, while he also continued to challenge traditions of landscape art.

Portraiture, Readymade: Arts of Substitution

Anne Goodyear and James McManus have variously demonstrated how Duchamp cannily employed varieties of portraiture and self-portraiture to

promote his legacy.³ He challenged standard understandings of portraiture throughout his career. For instance, his design of the catalog for the 1942 *First Papers of Surrealism* exhibit introduced the notion of the “compensation portrait” by substituting a found photograph in place of a portrait of each contributing artist. For instance, a woman’s face appropriated from a Dust Bowl photograph by Ben Shahn acted as a surrogate or substitute for Duchamp’s own portrait.

Long before that, Duchamp’s cohort of New York Dada artists had variously investigated the notion of the “object-portrait” or “substitution portrait.” In *Ici, c’est Stieglitz*, Duchamp’s friend Francis Picabia drily depicted a camera as a critical substitute for the photographer and gallerist Alfred Stieglitz. With the nonfunctioning apparatus shown, Picabia’s portrait displayed Stieglitz as incapable of realizing his idealistic dreams. Charles Demuth, a friend of Duchamp from the Arensberg circle in New York, similarly engaged the innovative notion of the substitution portrait in a 1928 painting titled *I Saw the Figure 5 in Gold*. In that work, Demuth visualized a speeding fire engine from a celebrated poem by William Carlos Williams to represent the poet without resorting to traditional forms of imitation or



c.4. Marcel Duchamp, *Allégorie de genre (Portrait of George Washington)*, 1943. Gauze soaked with iodine and fixed to cardboard backing by thirteen gilded paper stars on long nails painted white, 20¹⁵/₁₆ x 15¹⁵/₁₆ in. (54.8 x 42.7 x 7 cm). Musée national d’art moderne, Centre national d’art et de culture Georges Pompidou, Paris. AM 1987-632. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp. Photo Philippe Migeat. © CNAC/MNAM/Dist. RMN-Grand Palais / Art Resource, NY.

mimesis. For Duchamp, and for his friends among the Dada and Surrealist artists, such object portraits offered an alternative path that could sidestep the mimetic traditions of portraiture and of the fine arts in general.

Duchamp employed substitution as a working method, as Michel Leiris identified.⁴ An intimate knowledge of Raymond Roussel's work likely sensitized Leiris to the power of substitution at work for Duchamp.⁵ For Roussel, substitution functioned as an essential tool in the game-like mechanisms of linguistic formalism that he harnessed to write his novels.⁶ As I have argued in chapter 3, Duchamp's "art of substitution" may be understood through the readymades interpreted as stand-ins for celebrated monuments of modern Paris. These substitutions played with the idea of landscape, making it possible to re-create the landscape of Paris in his studio, on a reduced scale. Duchamp's 1967 prints substitute the artist's hand for the nonhuman thermonuclear landscape that clouded discussions of humanity's future at the time these posters rolled off the presses. Since the U.S. forces' dropping of atomic bombs on Hiroshima and Nagasaki, the world had arguably lived under the shadow of the atomic "mushroom" cloud. French government officials staked their claim in the postwar nuclear arms race, with nuclear testing in Algeria and the French South Pacific that scholar Kieran Lyons has provocatively associated with Duchamp's ambiguous 1967 Givaudan prints.

Duchamp's image fluctuates. Duchamp's poster is an ambiguous image. It is also an artful image, a constructed image, and deliberately deceptive. Although the smoke appears to emanate from Duchamp's cigar, this is a clever photomontage. Duchamp excised the smoke cloud from a photograph taken by Pierre Joly showing the French singer-songwriter Georges Brassens smoking a pipe. Incorporating found photography, the image becomes a variation on Duchamp's readymades. Like the scandalous *Fountain* of 1917, in which he "created a new thought for that object," Duchamp borrowed the singer-songwriter's smoke to assemble a convincing document of an "event" that, paradoxically, never existed.⁷

Around the time he created this clever photomontage, Duchamp welcomed the photographers Pierre Joly and Véra Cardot in his studio, where they photographed him. The duo was known for their collaborative photography of art and architecture, and Joly was recognized for his writings on art. Additionally, they were close friends of the singer Georges Brassens. In 1966 Joly and Cardot published a limited-edition book featuring their photographs of Brassens under the title *Célébration du visage*. Although the smoke in Duchamp's poster does not figure in any of the images in that

book, many of the photographs show close-up views of Brassens lighting and smoking his ubiquitous pipe or cigars. Joly and Cardot may have shared the initial print with Duchamp during studio conversations. By selecting and then “marrying” the two unrelated images, Duchamp created a sort of “assisted readymade” with a range of meanings for Duchamp’s oeuvre and for contemporary society circa 1967.

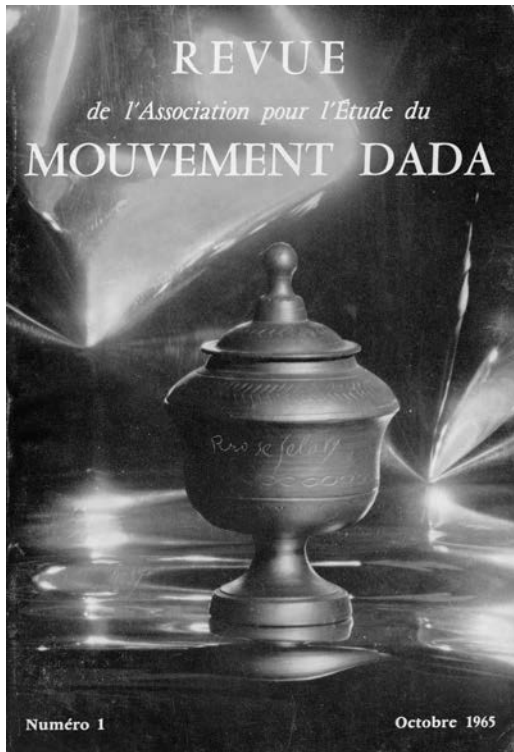
Duchamp’s experimental approaches to artmaking led him to work with materials as varied as dust and smoke throughout his career. In his design for the cover of *View* magazine’s Duchamp issue (1945) (figure 1.1, plate 1), the artist brought together dust and smoke to create a view that was at once personal and cosmic. The dust-covered bottle featured Duchamp’s military papers in the place of a label, making it a sort of surrogate for Duchamp himself, an object-portrait. The smoke it appears to “exhale” into outer space, made possible by Duchamp’s elaborate act of do-it-yourself bricolage, assumes the shape of earthly continents or even the Milky Way, in a conjunction of the individual and the cosmic.

Turning over *View* magazine’s Duchamp issue to examine its back cover, readers encountered one of the artist’s notes. This note, presented with intriguing typography, referred to smoke as if to echo the cover image. Here smoke offered a sensory experience that could demonstrate Duchamp’s concept of the infra-thin. Translated into English, the note reads, “When the tobacco smoke also smells of the mouth that exhales the smoke, the two odors marry by the infra-thin.” Smoke, perceived through multiple senses, embodied a difficult-to-grasp concept. Duchamp’s harnessing of ordinary experience to promote the understanding of complex concepts was a move akin to those utilized by the Palais de la découverte to popularize science.

An iconography of smoke, ashes, and cinders weaves through this last decade of the artist’s work. A smoking pipe appeared in Duchamp’s hand on the cover of the French edition of his writings, *Salt Seller*, from 1958. The next year, Robert Lebel published the first monograph devoted to Duchamp, its page design and contents largely directed by Duchamp himself. The lost image of the 1921 comet tonsure reappeared in Lebel’s book, displaying Duchamp holding a pipe with no smoke.

Ashes to Ashes: Duchamp’s Epitaph as a Work of Art

As Duchamp’s reputation soared, younger generations celebrated him, and his place in history was increasingly secured. Those associated with



c.5. Marcel Duchamp, *Urn with the Ashes of Duchamp's Cigar*, 1965, as featured on the cover of the *Revue de l'Association pour l'étude du mouvement Dada*, no. 1 (October 1965). Collection of the author. © 2015 Artists Rights Society (ARS), New York / ADAGP, Paris / Estate of Marcel Duchamp.

the Association for the Study of the Dada Movement invited Duchamp to a banquet in his honor on May 15, 1965. At the conclusion of the banquet, the papers containing remarks made in his honor were burned and, together with the ashes of Duchamp's cigar, collected in a tobacco jar whose shape recalled that of a funerary or crematory urn (figure c.5). The name of Rose Sélavy was etched upon the urn as a kind of signature and a potential sign of the urn's contents. Duchamp declared the object a "provoked readymade," and it ultimately found its place in the catalogue raisonné of the artist's collected works. The urn functions as an object-portrait or substitution portrait of Rose Sélavy (and, by extension, Duchamp himself). Like his 1967 poster for the Galerie Claude Givaudan, both portraits play with notions of life and death. Both works toy with mortality.

One finds the phrase *casser sa pipe*, or "to break one's pipe" among the many French slang expressions for the act of dying. Duchamp prepared himself for death's inevitability through careful and creative guardianship of his reputation from about 1946 onward. This included his diligent

search for a museum to be home to the Arensberg Collection, into which he had steered the majority of his artworks. After the Philadelphia Museum of Art accepted the collection, his labors continued: Duchamp worked to ensure good terms for its display and planned its initial installation in the museum's galleries. Ultimately, his "secret" work, *Etant donnés*, would be revealed posthumously, a gift to the Philadelphia Museum of Art. Collaborating with Lebel, Duchamp contributed materials from his personal collections and archives, and designed the layout for the resulting monograph, *Sur Marcel Duchamp* (1959). Duchamp's other professional activities during the last decade of his life might be seen as a "summing up" of his career, ranging from his cooperation with Walter Hopps to mount the first retrospective exhibition of his career (Pasadena, 1963), to his collaborations with Ulf Linde and Richard Hamilton to exhibit (and replicate) his works internationally. Even his ultimate accession to the International Collectors Society, allowing them to market the *Marcel Duchamp Art Medal* in 1967, seems a playful twist on the arch seriousness with which some late-career creators manage their legacy.⁸ Duchamp had long anticipated his late career, posing theatrically for the camera in an image that appeared in the special Duchamp issue of *View* (1945) with the caption "Marcel Duchamp at the Age of 85."⁹

Duchamp approached death with awareness and play during the last years of his life. According to his stepdaughter, Jackie Monnier, Duchamp carried a special scrap of paper (akin to one of the many facsimiles of his notes) with him late in life.¹⁰ On this note he had written the epitaph he had chosen for his tombstone: "Anyway, it's always the others who die."¹¹ Although this phrase has often been attributed to Duchamp himself, it is a variant on musings published by Paul Valéry in a pair of essays. "Death is beheld only by living eyes," Valéry wrote in a collection of essays titled *Mauvaises pensées et autres* (1941). This seems to have been a prolonged meditation on a phrase he attributed to Leo Ferrero, for whose *Leonardo or the Work of Art* (1929) Valéry contributed an introduction. Ferrero was a promising Italian author who had contributed to French literary magazines in his youth, written a dissertation about Leonardo da Vinci (1927), and ultimately fled fascist Italy to come to Paris (1928) where he met Valéry. Funded as a Rockefeller Foundation Fellow, Ferrero traveled to Santa Fe, New Mexico, to participate in an "Impact Seminar" with the renowned linguist and anthropologist Edward Sapir.¹² Sometime after Ferrero's tragic death in an automobile accident in New Mexico on August 26, 1933, Valéry

revisited his own writings on Leonardo and annotated them with marginal notes. Appending a memorial “note” at the end of his essay for Ferrero, Valéry wrote, “Paris was adopting him as a son, when misfortune would have it that he must visit America, and there he was overtaken by death—of which he had written, ‘It is something that happens only to others.’”¹³

Valéry’s 1929 introduction to Ferrero’s *Leonardo or the Work of Art*, titled “Leonardo and the Philosophers,” began as a letter to the younger author Ferrero. In it, Valéry argued against aesthetics. At the same time, Valéry acknowledged that the philosopher’s activity of writing aesthetics could be an inherently creative act. Like Valéry’s writings on Leonardo, Duchamp’s concise 1957 statement on the “Creative Act” emphasizes the role of the audience in determining the fate of an artwork. Both Duchamp and Valéry were intrigued by the impact played by “posterity” in shaping an artwork’s reception and, thereby, its meaning and destiny.

Not every edition of “Leonardo and the Philosophers” included the memorial postscript with the phrase so similar to Duchamp’s epitaph. Duchamp could have encountered the appended memorial note in several editions, including the republication of Valéry’s essay in a popular 1966 anthology, *Leonardo da Vinci: Aspects of the Renaissance Genius*.¹⁴ Duchamp almost certainly knew the December 1946 issue of *View* magazine that referred to both of Valéry’s meditations on death. At the time, Duchamp was active on the editorial board of *View*, as was Mary Reynolds who acted from her Paris home as the magazine’s European editor. The December 1946 issue appeared in a green wrapper featuring a reproduction of a work by René Magritte on its cover and Alfred Jarry’s woodcut of Ubu on its reverse.¹⁵ Dedicated to Surrealism in Belgium, the issue had been organized by Marcel Mariën, who contributed a poetic essay titled “Psychological Aspects of the Fourth Dimension” on pages 7–10 of *View*.¹⁶ Given Duchamp’s interest in the fourth dimension, this would have likely caught his eye, although Mariën’s approach to the subject seems inconsistent with the spatial fourth dimension of Gaston de Pawlowski and the temporal fourth dimension of Albert Einstein. “Death is the only means of access to the three dimensions,” Mariën suggested. “Yet it [death] does not exist. Subject neither to experimental control nor to the experience of having been consciously lived, is it not false to believe it? One is only what one experiences . . . *there is no death but that of the next fellow.*”¹⁷ Elaborating on the italicized phrase in a footnote, Mariën divulged that “these lines were barely written when, on buying *Mauvaises pensées et autres* by Valéry, I fell upon

the following phrase, which is an excellent summary of the book: 'Death is beheld only by living eyes.' To each his own thought; but a little later, impelled by chance, I opened *Variété III* to find this definition of death, given by Leo Ferrero, and cited by Valéry: '(Death) is something that happens only to the other fellow. . . .' Unto whom, then, we may finally add, must be rendered what pertains to death?"¹⁸

A remarkable symmetry connects Duchamp's epitaph with Ferrero's thoughts as conveyed by Valéry. This may be a conclusive symmetry, through which Duchamp returned to Valéry, an author whose ideas may have prompted Duchamp to action with the 1938 Paris Surrealist exhibition. At other times, Valéry's ideas were remarkably consistent with Duchamp's carefully limited words.

While the epitaph Duchamp chose for his tomb thus links back to Valéry, it also recalls the shared fascination both men held for Leonardo da Vinci and Stéphane Mallarmé. Duchamp's iconography of cigars and ashes recalls a poem by Mallarmé, who invoked the human soul metaphorically through the image of a burning cigar. Mallarmé's cigar appears in the untitled short poem written in 1895 generally referred to by its first verse, "Toute l'âme résumée" (The whole soul summed up). The closing couplet of the poem rhymes "rature" (erasure) with "littérature," anticipating the ways Duchamp and his friends among the Parisian Surrealists transformed the journal named *Littérature* into *Lits et Ratures*.¹⁹

*Toute l'âme résumée
Quand lente nous l'expirons
Dans plusieurs ronds de fumée
Abolis en autres ronds*

*Atteste quelque cigare
Brûlant savamment pour peu
Que la cendre se sépare
De son clair baiser de feu*

*Ainsi le chœur des romances
À la lèvre vole-t-il
Exclus-en si tu commences
Le réel parce que vil*

*Le sens trop précis rature
Ta vague littérature.*

We express our whole soul when we slowly exhale
Those several rings of smoke
Driven out by other rings
That attest to some cigar, briefly, brilliantly smoldering
—Separated by an ash—
From the clear kiss of fire

Thus the choir of romances
Rises to your lips—
If you begin, begin by
Excluding reality. It is vile.

Too much precision of sense erases
Your vague literature.²⁰

If death was on Duchamp's mind around 1966, it nestled there in a playful way in which the phrase "ashes to ashes" holds a distinctly secular meaning, applicable equally to a cigar or a human body. Cigars and comets could stand as metaphors for the brevity of human existence. Or, through association, Duchamp's ubiquitous cigar stands in as a nonhuman portrait of the artist himself. Considered within the geopolitical contexts of the Cold War and the last decade of Duchamp's life, this "substitution portrait" merits consideration as "a portrait of the artist as a thermonuclear landscape," to coin a phrase. In this image, the cigar smoke curls as if it were a mushroom cloud expanding into the atmosphere. Duchamp's poster engaged subtly and decisively with the landscape tradition once again. Yet there is no landscape visible here, only the artist's hand and a plume of smoke. With this work, in the form of a printed readymade, Duchamp toyed simultaneously with the earthly landscape and celestial skyscape. As in so many of the examples discussed in his book, he defied the landscape tradition once again. Simultaneously, he denied the promise of the heavens; the celestial realm was no passage to paradise, no pathway to truth. It was space—only space. Duchamp's cigar turned to ash in the manner of the cigar in Mallarmé's poem in which the human and cosmic intertwined, as if playing with earth and sky.

NOTES

EPIGRAPHS: Denis Cosgrove, *Social Formation and Symbolic Landscape*, rev. ed. (Madison: University of Wisconsin Press, 1998), 13; Guy Viau interview of Marcel Duchamp on Canadian Radio Television, July 17, 1960, translated by Sarah Skinner Kilborne, modified by James Housefield, in *tout fait the Marcel Duchamp online studies journal* 2, no. 4 (2002); Friedrich von Schiller and Arthur Jung, *Schillers Briefe über die ästhetische Erziehung des Menschen* (Leipzig, Germany: B. G. Teubner, 1875 [orig. 1794–95]).

Introduction

1. “Aristotle imagined the Milky Way to be gaseous emanations from the Earth which were set on fire in the sky,” as noted by a popular science writer in the early twentieth century. George Frederick Chambers, *The Story of the Stars* (New York: D. Appleton, 1912), 135.

2. The psychologist Joseph Jastrow investigated the bi-stable image first seen in the Munich-based humor magazine *Fliegende Blätter* (October 23, 1892, p. 147) after it appeared as a cartoon published in *Harper’s Weekly* (November 19, 1892, p. 1114). The art historian Ernst Gombrich associated the image with the philosopher Ludwig Wittgenstein; for both of them the duck-rabbit figure was emblematic. See Ernst Gombrich, *Art and Illusion: A Study in the Psychology of Pictorial Representation* (New York: Pantheon, 1960); Joseph Jastrow, “The Mind’s Eye,” *Popular Science Monthly* 54 (1900): 299–312; and Ludwig Wittgenstein, *Philosophical Investigations* (Oxford, UK: Blackwell, 1958).

3. After decades of relative neglect, due largely to the scarcity of their small print runs and ephemeral nature, “little magazines” have gained burgeoning scholarly attention over the past decade. Digital reproduction of the original publications has facilitated access to these journals as never before. See especially the “Modernist Magazines Project,” created by Peter Brooker and Andrew Thacker (<http://www.modernistmagazines.com/>) and the “Modernist Journals Project,” collaboratively produced by Brown University and the University of Tulsa (<http://modjournal.org/>). Similarly, the International Dada Archive at the University of Iowa has made available a tremendous resource with their “Digital Dada Library Collection” (<http://sdr.lib.uiowa.edu/dada/collection.html>).

4. For an excellent overview, see Stamatina Dimakopoulou, “Europe in America:

Remapping Broken Cultural Lines: *View* (1940-7) and *VVV* (1942-4),” in *The Oxford Critical and Cultural History of Modernist Magazines*, vol. 2: *North America, 1894-1960*, ed. Peter Brooker and Andrew Thacker, 737-58 (Oxford: Oxford University Press, 2012). On *View*, see Charles Henri Ford, Catrina Neiman, and Paul Nathan, eds., *View: Parade of the Avant-Garde; An Anthology of View Magazine, 1940-1947* (New York: Thunder’s Mouth Press, 1991); and Alan Jones, “*Carte Blanche*: Charles Henri Ford and *View*; A Poet Makes an Art Magazine,” *Arts Magazine* 69, no. 1 (September 1989): 17-18.

5. Peter Lindamood, “I Cover the Cover,” *View* 5, no. 1 (March 1945): 3.

6. My analysis is informed by the catalog entry by Jennifer E. Quick discussing this magazine cover in Anne Collins Goodyear and James W. McManus, eds., *Inventing Marcel Duchamp: The Dynamics of Portraiture* (Washington, DC: National Portrait Gallery, 2009), 194.

7. The quote “planetarium illusion of the background” comes from Lindamood’s essay (p. 3), which detailed the challenges faced by Duchamp and the artist’s tenacity in achieving the desired result. Lindamood’s essay displayed special interest in Duchamp’s knowledge of graphic design technologies, specifically those of halftone screens. “Now between the third (or fourth?) montage-stage which Duchamp showed me and the finished job, I understand, there were to be several more interludes. All this latter involves quite magical little half-tone screens which push the peppery stars way back into the telescopic reality of the Milky Way, at the same time isolating and pointing up the wine bottle in all its sculptural glory. . . . Finally, all the color accents involved in the cover-making—arrived there thanks to the wizardry of those half-tone screens—whose potentialities Marcel was too modest to admit to me he had considerably expanded during the accouchement” (Lindamood, “I Cover the Cover,” 3). Lindamood’s essay concluded provocatively with a French term referring to the process of giving birth, a “loan word” accepted in the American English lexicon. His word choice might reinforce the notion of the slow “gestation” and much-awaited or eventful “delivery” of a work of art and design.

8. *View*, March 1945, 37. Ford’s words appear as an isolated phrase near two reproductions of artworks: Yves Tanguy’s *Homage to Duchamp* (1945) and *L’apprenti dans le soleil—Readymade by Matta*, its title adapted from a manuscript note by Duchamp. In another poetic phrase appearing above Ford’s, *View* magazine’s managing editor John Bernard Myers adapted the term “gazetteer”—referring to the encyclopedic lists of place-names that accompany a map or atlas—to forge a neologism, “gadgeteer.” In the words of Myers, “Duchamp: gadgeteer of the Unconscious.”

9. Marcel Duchamp, *Salt Seller: The Writings of Marcel Duchamp*, ed. Michael Sanoillet and Elmer Peterson (New York: Oxford University Press, 1973), 78.

10. Léger recalled Duchamp’s statement in 1952, some forty years after the event. See Dora Vallier, “La vie fait l’œuvre de Fernand Léger,” *Cahiers d’Art* 29, no. 3 (1954): 140.

11. André Breton, “The Point of View: Testimony 45,” *View* 5, no. 1 (March 1945): 5.

12. Until the late twentieth century, Duchamp’s design-related activities were often relegated to a secondary status when viewed in the context of his own creative oeuvre. Francis Naumann has given serious consideration to Duchamp and design; see,

especially, Francis M. Naumann, *Marcel Duchamp: The Art of Making Art in the Age of Mechanical Reproduction* (New York: Abrams, 1999).

13. Different points of rupture have been discussed as singularly transformative for Duchamp, for instance, his brothers' March 1912 rejection of *Nude Descending a Staircase* (No. 2) from the Salon des Indépendants, Paris; the artist's time in Munich (June–August 1912); his subsequent embrace of a mechanomorphic approach to drawing and painting; his creation of the first readymades (1912–13); and the painting of *Tu m'* (1918). Without reviewing the full historiography here, the most vocal theories of Duchampian rupture have been those associated with the emergence of the readymades, especially in the work of Thierry de Duve. Thierry de Duve, *Pictorial Nominalism: On Marcel Duchamp's Passage from Painting to the Readymade* (Minneapolis: University of Minnesota Press, 1991).

14. On Duchamp's quote that modern titles of artworks constituted "invisible colors," see John Welchman, *Invisible Colors: A Visual History of Titles* (New Haven, CT: Yale University Press, 1997), 8.

15. Duchamp's wife, Mme Alexina "Teeny" Duchamp, wrote to Henderson documenting his love of these museums; he made a point of taking her to visit these museums with him again in the 1960s. Linda Dalrymple Henderson, *Duchamp in Context: Science and Technology in the Large Glass and Related Works* (Princeton, NJ: Princeton University Press, 1998), 18, 244n15. Although Duchamp lived many years in New York, I have not discovered evidence of his interests in the American Museum of Natural History or the Hayden Planetarium. Therefore these important spaces of scientific display do not figure significantly here.

16. My understanding of "play" and its implications for art and design are indebted to the classic study by Johan Huizinga, *Homo Ludens: A Study of the Play-Element in Culture* (Boston: Beacon, 1955). For essays analyzing ludic aspects of modern art, see David Getsy, ed., *From Diversion to Subversion: Games, Play, and Twentieth-Century Art* (University Park: Pennsylvania State University Press, 2011).

17. Jacques Derrida, "Structure, Sign and Play in the Discourse of the Human Sciences," in *Writing and Difference*, 278–94 (Chicago: University of Chicago Press, 1978 [orig. 1966]).

18. Linda Dalrymple Henderson, "Editor's Introduction: 1, Writing Modern Art and Science—An Overview; II, Cubism, Futurism, and Ether Physics in the Early Twentieth Century," *Science in Context* 17 (Winter 2004): 423–66. Among the sources Henderson refers to, I have emphasized the theorization of intentionality and influence offered by Michael Baxandall, *Patterns of Intention: On the Historical Explanation of Pictures* (New Haven, CT: Yale University Press, 1985).

19. Henderson, "Editor's Introduction," 437.

20. My approach benefits from Holly Henry's example, analyzing Virginia Woolf's engagement with astronomy. Holly Henry, *Virginia Woolf and the Discourse of Science: The Aesthetics of Astronomy* (Cambridge: Cambridge University Press, 2003).

21. Kirsten Hoving, *Joseph Cornell and Astronomy: A Case for the Stars* (Princeton, NJ: Princeton University Press, 2008).

22. By the time Duchamp arrived in Greenwich Village in 1915, Stirner's book was

well known in English translation: Max Stirner, *The Ego and His Own (Der Einzige und sein Eigentum)*, trans. Steven T. Byington (New York: E. C. Walker, 1913 [orig. 1845]). Stirner's book was available in at least two paperback editions of French translations by 1900 and was discussed in the international popular press.

23. Pierre Cabanne, *Dialogues with Marcel Duchamp* (New York: Da Capo Press, 1987), 42–43.

24. *Ibid.*

25. Henderson, *Duchamp in Context*.

26. On flight as a theme for modern and contemporary art, see Anne Collins Goodyear, *Flight: A Celebration of 100 Years in Art and Literature* (New York: Welcome Books, 2003); Sam Smiles, *Flight and the Artistic Imagination* (London: Compton Verney Gallery in association with Paul Holberton Publishing, 2012); Anne Collins Goodyear, "The Effect of Flight on Art in the Twentieth Century," in *Reconsidering a Century of Flight*, ed. Jane Rose Daly Bednarek and Roger D. Launius, 223–41 (Chapel Hill, NC: University of North Carolina Press, 2003); Anne Collins Goodyear, "The Legacy of Kitty Hawk: A Century of Flight in Art," in *Defying Gravity: Contemporary Art and Flight*, ed. Huston Paschal and Linda Johnson Dougherty, 31–41 (Raleigh, NC: North Carolina Museum of Art, 2003). For clouds as a curatorial theme, see Tobias G. Natter and Franz Smola, eds., *Wolken: Welt des Flüchtigen* (Ostfildern, Germany: Hatje Cantz for the Leopold Museum, Vienna, 2013). On contemporary artists' fascination with space flight, see, for instance, Alex Baker and Toby Kamps, *Space Is the Place* (New York: Independent Curators International and Contemporary Arts Center, 2006); Walter Famler and Catherine Hug, *Weltraum: Die Kunst und ein Traum (Space: About a dream)* (Nuremberg, Germany: Verlag für Moderne Kunst, 2011). On art and geography as forms of representation, see Denis E. Cosgrove, *Geography and Vision: Seeing, Imagining and Representing the World* (London: I. B. Tauris, distributed by Palgrave Macmillan, 2008). Scholarship on art and cartography is too large a field to discuss at length here; see Francesca Fiorani, *The Marvel of Maps: Art, Cartography and Politics in Renaissance Italy* (New Haven, CT: Yale University Press, 2005); David Woodward, *Art and Cartography: Six Historical Essays*, Kenneth Nebenzahl Jr. Lectures in the History of Cartography (Chicago: University of Chicago Press, 1987). For an artistically focused approach to cartography, see Katharine A. Harmon and Gayle Clemons, *The Map as Art: Contemporary Artists Explore Cartography* (New York: Princeton Architectural Press, 2009). In its massive scope, the millennium-marking exhibition *Cosmos* signaled an extreme example of recent attempts to display artistic representations of humans' place in the cosmos, integrating astronomy with geography to forge large-scale modern systems considering the interconnectedness of life; see Jean Clair and Pierre Théberge, eds., *Cosmos: Du romantisme à l'avant-garde* (Montreal: Musée des Beaux-Arts de Montréal, 1999).

27. "Duchamp's Urinal Tops Art Survey," *BBC News*, December 1, 2004, <http://news.bbc.co.uk/>.

28. On the back of this note, as Sanouillet and Peterson indicate, Duchamp wrote "1913." See Duchamp, *Salt Seller*, 74.

29. John Dewey, *Art as Experience* (New York: Minton, 1934). Mark Rosenthal, *Understanding Installation Art: From Duchamp to Holzer* (Munich: Prestel, 2003).

30. My thinking about Duchamp as designer of experiences has benefited from conversations with countless students, friends, and colleagues, including architectural historian Kai Gutschow, who has analyzed the multisensory goals of architects; see Kai K. Gutschow, "From Object to Installation in Bruno Taut's Exhibit Pavilions," *Journal of Architectural Education* 59, no. 4 (2006): 63–70.

31. Oliver Grau, *MediaArtHistories* (Cambridge, MA: MIT Press, 2007).

32. Alison Griffiths, *Shivers Down Your Spine: Cinema, Museums, and the Immersive View* (New York: Columbia University Press, 2008), 2.

33. Resurgent interest in the Gesamtkunstwerk has motivated new appraisals of embodied experience and its importance for modern artists and their audiences. See Juliet Bellow, *Modernism on Stage: The Ballets Russes and the Parisian Avant-Garde* (Burlington, VT: Ashgate, 2012); Patrizia Di Bello and Gabriel Koureas, *Art, History and the Senses: 1830 to the Present* (Burlington, VT: Ashgate, 2010); Anke K. Finger and Danielle Follett, *The Aesthetics of the Total Artwork: On Borders and Fragments, Rethinking Theory* (Baltimore: Johns Hopkins University Press, 2010); Juliet Koss, *Modernism after Wagner* (Minneapolis: University of Minnesota Press, 2010); and Matthew Wilson Smith, *The Total Work of Art: From Bayreuth to Cyberspace* (New York: Routledge, 2007).

34. Janine A. Mileaf, *Please Touch: Dada and Surrealist Objects after the Readymade, Interfaces: Studies in Visual Culture* (Hanover, NH: Dartmouth College Press, 2010). For related views on the significance of tactility for art and modern media, see Erkki Huhtamo, "Twin-Touch-Test-Redux: Media Archaeological Approach to Art, Interactivity, and Tactility," in *MediaArtHistories*, ed. Oliver Grau, 71–102 (Cambridge, MA: MIT Press, 2007).

35. Caroline A. Jones and Bill Arning, *Sensorium: Embodied Experience, Technology, and Contemporary Art*, 1st MIT Press ed. (Cambridge, MA: MIT Press, MIT List Visual Arts Center, 2006). See also Barbara Bolt, *Sensorium: Aesthetics, Art, Life* (Newcastle, UK: Cambridge Scholars, 2007); Di Bello and Koureas, *Art, History*. Other disciplines preceded art history's investigation of senses beyond the optical. Since 1988, anthropologist David Howes has led a research group studying various cultural aspects of the sensorium, the Concordia Sensoria Research Team or "CONCERT," while publishing his own scholarship and editing related books. See David Howes, *Sensual Relations: Engaging the Senses in Culture and Social Theory* (Ann Arbor: University of Michigan Press, 2003); David Howes, ed., *Empire of the Senses: The Sensual Culture Reader* (Oxford, UK: Berg, 2005).

36. Scholars generally refer to Duchamp's cohort circa 1910–12 as the "Salon Cubists" or "Puteaux Cubists" to distinguish their goals and practices from those of Pablo Picasso and Georges Braque. The term "Puteaux Cubists" employs the place-name where their residences were located outside Paris and where Duchamp joined his brothers for weekly gatherings. Albert Gleizes and Jean Metzinger were the most outspoken of the Puteaux Cubists, emerging as theorists of Cubism in the absence of statements from Picasso and Braque. The geographical sensibilities of the Puteaux Cubists were tinged by their friendship with the author Jules Romains and his visions of communities linked by "Unanisme." Mark Antliff and Pat Leighten challenged the

common distinction between Puteaux Cubists and the *bande à Picasso* in their commentary on documents from the Cubist epoch; see Mark Antliff and Patricia Leighton, *A Cubism Reader: Documents and Criticism, 1906–1914* (Chicago: University of Chicago Press, 2008).

37. Here I employ “ground truth” as a deliberate anachronism meant to invoke discussions (that postdate Duchamp) about the disjunction between data collection and human experience of physical geography. My use of the phrase “ground truth” is indebted to discussions with geographers, especially the critical work of John Pickles. “Ground truthing” refers to on-site research or fieldwork collected to complement mapping data produced by varieties of remote sensing (including aerial photography) and geographic information systems (GIS). See John Pickles, ed., *Ground Truth: The Social Implications of Geographic Information Systems* (New York: Guilford, 1994); in a larger context, see John Pickles, *A History of Spaces: Cartographic Reason, Mapping and the Geo-Coded World* (Abingdon, UK: Routledge, 2003).

38. In a letter to Henri Cazalis dated October 30, 1864, Mallarmé wrote, “Paint not the thing but the effect that it produces.” Stéphane Mallarmé, *Correspondance*, vol. 1: 1862–1871, ed. Henri Mondor and James Lloyd Austin (Paris: Gallimard, 1959), 137. This oft-quoted statement summarizes the goal of the Symbolist artists and authors for whom Mallarmé was a guiding light.

39. Francis Roberts, “I Propose to Strain the Laws of Physics,” *Art News* 67, no. 8 (1968): 46–47, 62–64.

40. Henderson, *Duchamp in Context*, 18. See also Bogen, “Munich 1912: A Museum of Technology Writes Art History,” in *Marcel Duchamp in Munich, 1912*, ed. Helmut Friedel, Thomas Girst, Matthias Mühling, and Felicia Rappe, 69–82 (Munich: Schirmer/Mosel, 2012).

41. Uncited references in this paragraph come from personal communication with Jackie Monnier, August 2011. I thank Jackie for kindly welcoming me to her home and the archives of the Association Marcel Duchamp, and especially for conversations about Duchamp and the family history. A color reproduction of Duchamp’s painting *Portrait du Dr Dumouchel* appeared in *Lectures pour tous*, December 1964; he inserted it in place of the black-and-white reproductions in examples of his box made in 1966 and after, as Ecke Bonk has detailed. Ecke Bonk, *Marcel Duchamp, the Box in a Valise: De ou par Marcel Duchamp ou Rrose Sélavy; An Inventory of an Edition* (New York: Rizzoli, 1989), 225.

42. Robert Monnier, born February 17, 1959.

43. For a concise analysis of Ernst’s engagement with astronomy, see John G. Hatch, “Desire, Heavenly Bodies, and a Surrealist’s Fascination with the Celestial Theatre,” *Culture and Cosmos* 8, nos. 1–2 (2004): 87–106. Ernst’s alchemical pursuits are analyzed convincingly in M. E. Warlick, *Max Ernst and Alchemy: A Magician in Search of a Myth* (Austin: University of Texas Press, 2001).

44. Kirsten Hoving treats these themes; see Hoving, *Joseph Cornell and Astronomy*. For a view of Cornell as engaged with contemporary geopolitical thought, see James Housefield and Diana K. Davis, “Joseph Cornell, Geographer of Utopia Parkway,” in *Joseph Cornell: Opening the Box*, ed. Stephanie L. Taylor and Jason Edwards, 47–68 (Bern, Switzerland: Peter Lang, 2007).

45. Such cosmic metaphors motivated the playful title of Jean Lipman's *Calder's Universe* (New York: Running Press, 1999).

46. J. D. Mehl, "A Transit of Mercury, November 7, 1914," *Publication of the Pomona College Astronomical Society* 4 (October 1914): 38.

47. Jean-Paul Ameline and Pascal Rousseau, eds., *Robert Delaunay: 1906-1916; De l'impressionnisme à l'abstraction* (Paris: Centre Georges Pompidou, 1999).

1. Spaces of Experience

1. Pierre Foncin, *Géographie de la France*, 27th ed. (Paris: Armand Colin, 1895). For the map "Grandes lignes françaises de navigation," see page 81 of Foncin's book.

2. I thank Duchamp's heirs, Jacqueline Matisse Monnier and Antoine Monnier, for their generosity, including the opportunity to consult this book and other materials from the Duchamp family archives. Noted French geographer Pierre Foncin (1841-1916) published extensively, in widely used popular textbooks and in scholarly venues (he was a contributor to the influential journal *Annales de Géographie* from its first appearance). See Paul Vidal de la Blache, "Pierre Foncin," *Annales de Géographie* 26, no. 139 (1917): 67-70.

3. Marc Décimo, *La bibliothèque de Marcel Duchamp, peut-être* (Paris: Les Presses du Réel, 2002), 83-84, suggests that the book was inscribed by Duchamp's brother Jacques Villon.

4. Griffiths, *Shivers Down Your Spine*; Vanessa R. Schwartz, *Spectacular Realities: Early Mass Culture in Fin-de-Siècle Paris* (Berkeley: University of California Press, 1998).

5. The identification of Boilly's sitter as "Monsieur Gaudry," and his friendship with the painter, is discussed in Paul Marmottan, *Le peintre Louis Boilly (1761-1845)* (Paris: H. Gateau, 1913); and Margaret A. Oppenheimer, *The French Portrait: Revolution to Restoration* (Northampton, MA: Smith College Museum of Art, 2005).

6. The theme of the geography lesson recurs variously throughout European painting from the eighteenth and nineteenth centuries. For discussion of Pietro Longhi's variations on the theme (1750 and 1752), see Giuliana Bruno, *Atlas of Emotion: Journeys in Art, Architecture, and Film* (New York: Verso, 2002); and Denis E. Cosgrove, *Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination* (Baltimore: Johns Hopkins University Press, 2001). Bruno remarks on a convergence of geography and the feminine, and on how the "progression from geography to cosmetics to venture was a path; the course of learning how to 'fashion' the self in space" (214).

7. A group of portraits by Anne-Louis Girodet-Trioson (including a canvas also titled *The Geography Lesson*) merit comparison with Boilly's work and help to situate the iconography of geographical attributes within paintings of this epoch. See Jean-Pierre Chevalier, "La leçon de géographie, un tableau peint par Girodet en 1803," *M@ppemonde*, no. 80 (2005), <http://mappemonde.mgm.fr/>.

8. On the iconography of the Sun King and the political dimensions of its appearance across art and material culture, see Steven G. Reinhardt, *The Sun King: Louis XIV and the New World* (New Orleans: Louisiana State Museum, 1984). The significance

of the iconography of le Roi-Soleil was first demonstrated to me by Franklin Brooks, for whose mentoring I remain grateful. F. Hamilton Hazlehurst's lectures and writings subsequently enlarged my appreciation of Louis XIV; see Hazlehurst, *Gardens of Illusion: The Genius of André Le Nostre* (Nashville: Vanderbilt University Press, 1980); Hazlehurst, *Des jardins d'illusion: Le génie d'André Le Nostre* (Paris: Somogy Editions d'Art, 2005). More recently, it has been a joy to revisit the Sun King's impact on French culture through conversations with Claire Goldstein, friend and colleague at UC Davis. For an astronomically intelligent analysis of the intellectual heritage of the court of the Sun King, see Claire Goldstein, "Le regard en déroute: La comète de 1680," *Littératures Classiques* 82 (2013): 159-72.

9. Cosgrove, *Apollo's Eye*, 166-75.

10. Anne Godlewska, *Geography Unbound: French Geographic Science from Cassini to Humboldt* (Chicago: University of Chicago Press, 1999), 78.

11. Preparation of precision optics for theodolites and geodetic tools became a matter of national security interest and secrecy. Josef Konvitz describes how Cassini IV traveled to London during the surveys and attempted to learn more about the innovative techniques of Joseph Ramsden for making precision optics. Members of the Royal Academy of Sciences, assigned to keep watch over Cassini, thwarted his efforts to observe Ramsden and to recruit the Englishman to work at l'Observatoire de Paris. On Cassini, the Cassini surveys, and the resulting map, see Jean-Dominique Cassini, *Mémoires pour servir à l'histoire des sciences et à celle de l'Observatoire Royal de Paris, suivis de la vie de J.-D. Cassini, écrite par lui-même, et des éloges de plusieurs académiciens morts pendant la Révolution* (Paris: Bleuet, 1810); Godlewska, *Geography Unbound*; Josef W. Konvitz, *Cartography in France, 1660-1848: Science, Engineering, and Statecraft* (Chicago: University of Chicago Press, 1987), 27.

12. Most of the Cassini map's sheets, or *feuilles*, measure 64 x 95 cm each.

13. As discussed below, the standardization of weights and measures promoted by the Pavillon de Breteuil, l'Observatoire de Paris, and the Conservatoire national des arts et métiers, among others, was designed in part to reduce confusion emanating from the array of competing measurement systems such as that of the French royal *pouce* and *toise*. Following the standardized metric system, 1:86,400 means that one centimeter of distance on the Cassini map is equivalent to approximately 864 meters on the physical landscape it represents.

14. The Paris-based Institut géographique nationale (IGN) promoted distinct forms of public engagement with monumental maps from 1990 to 2012, including notable displays of the Cassini map (2000; "Mériidienne verte" project) and the nineteenth-century Carte d'état-major (2012; "La France en relief" exposition). In these and related projects, the IGN displayed maps on the ground, under plexiglass, to facilitate audience interaction. See "Petit historique des cartes de France IGN géantes (1990-2012)," *Globe* (blog), accessed October 16, 2015, <http://www.franceculture.fr/>.

15. See chapter 4 for the discussion of Duchamp's playful covering of the walls with maps in his room at the Paris home of his longtime confidante Mary Reynolds.

16. See John Brian Harley, "The Map and the Development of the History of Car-

tography,” in *The History of Cartography*, ed. J. B. Harley and David Woodward, 1–42 (Chicago: University of Chicago Press, 1987), esp. 12–13.

17. *Ibid.*, 12.

18. For discussion of the public feud between Jomard and the Portuguese Santarém (Manuel Francisco de Barros e Sousa, Viscount of Santarém), see *ibid.*, 13. On Jomard’s larger contributions to geography, see Godlewska, *Geography Unbound*.

19. Charles Letort, “Les grands globes de la Bibliothèque Nationale,” *La Nature* 3, no. 116 (1875): 177–79.

20. The International Congress appears to have been held over two or more sessions, the first on July 1531, followed by the ceremonial opening on August 1 and the second session on August 1–11. Organizers of the congress and the parallel exhibit at the Bibliothèque Nationale cataloged the exhibitions fastidiously; see Congrès international de géographie, *Exposition de 1875. Annexe A. Bibliothèque Nationale* (Paris: Lahure, 1875); Congrès international de géographie and Société de géographie, *Congrès international des sciences géographiques tenu à Paris du 1er au 11 août 1875: Compte-rendu des séances* (Paris: E. Martinet, 1878); and Félix Fournier and Congrès international de géographie, *Exposition, catalogue général des produits exposés rédigé . . . Par M. Félix Fournier* (Paris: Lahure, 1875).

21. Letort, “Les grands globes.”

22. Löwy’s photograph shows a sculpture by Albert-Ernest Carrier-Belleuse (1824–87), *Nymphe Marine*, 1873, destined for a fountain designed by Gabriel Davioud (1823–81) and placed in the south corner of the Place du Théâtre Français (today known as place André Malraux).

23. In an unpublished paper presented for the Association of American Geographers, “Perception and Experience: Representations of the City of Paris in Modern Art,” Pittsburgh, 2000. I argued for recognition of Marville as the first to exhibit what the twentieth century would call a “rephotographic survey,” a tool geographers use to study landscape change. My understanding of Marville has broadened through conversations with Sarah Kennel, associate curator in the Department of Photographs at the National Gallery of Art, Washington. Under Kennel’s leadership, a team of scholars recently unearthed essential details that offer the first complete biographical sketch of Marville’s life. On Marville as a photographer more generally, see the excellent essays in Sarah Kennel et al., *Charles Marville: Photographer of Paris* (Chicago: University of Chicago Press, 2013).

24. I thank photographer Byron Wolfe for conversations on the continuing implications of rephotographic surveys for artists, geographers, and others. See Mark Klett et al., *Reconstructing the View: The Grand Canyon Photographs of Mark Klett and Byron Wolfe* (Berkeley: University of California Press, 2012). For a broad discussion of the notion of rephotography, see Mark Klett, Ellen Manchester, and JoAnn Verburg, *Second View: The Rephotographic Survey Project* (Albuquerque: University of New Mexico Press, 1984).

25. Joke de Wolf, “Paris on Display: Marville’s Photographs at the Universal Exhibitions,” in *Charles Marville: Photographer of Paris*, ed. Sarah Kennel, 206–19 (Chicago:

University of Chicago Press, 2013). For a general view of Marville's participation in the Pavillon de la Ville de Paris, see Colette Wilson, "Memory and the Politics of Forgetting: Paris, the Commune, and the 1878 Exposition Universelle," *Journal of European Studies* 35, no. 47 (2005): 47–63. Without necessarily intending to do so, histories of the development of urbanism in Paris further developed an approach comparable to those promoted by the 1878 and subsequent exhibits of historic French maps, perhaps most elegantly in the content and design of Pierre Couperie, André Chastel, and Joël Cuénot, *Paris au fil du temps, atlas historique d'urbanisme et d'architecture* (Paris: J. Cuénot, 1968).

26. Löwy won a silver medal for photography at the 1878 exposition. Public affection was so great for the distinct iron, brick, and terra-cotta structure of the Pavillon de la Ville de Paris, designed by architect Joseph Antoine Bouvard (1840–1920) to be like a jeweled box, that it was moved and reconstructed on the Champs Elysées, between the Palais de l'Industrie and the Cours-la-Reine, in advance of the Electricity Exhibition of 1881.

27. On the maps issued by Jules Ferry's Ministry of Education, see Frederic H. Seager, "The Alsace-Lorraine Question in France, 1871–1914," in *From the Ancien Régime to the Popular Front: Essays in the History of Modern France in Honor of Shepard B. Clough*, ed. Charles K. Warner, 111–26 (New York: Columbia University Press, 1969).

28. Firmin Javel, "Salon de 1887 (16th installment)," *L'Art Français* 1, no. 19 (September 4, 1887).

29. Richard Thomson, *The Troubled Republic: Visual Culture and Social Debate in France, 1889–1900* (New Haven, CT: Yale University Press, 2004), 198. See also Gabriel P. Weisberg, Van Gogh Museum Amsterdam, and Ateneumin Taidemuseo (Helsinki, Finland), *Illusions of Reality: Naturalist Painting, Photography, Theatre, and Cinema, 1875–1918* (Brussels: Mercatorfonds; distributed by Distributed Art Publishers, 2010).

30. Romy Golan, *Modernity and Nostalgia: Art and Politics in France between the Wars* (New Haven, CT: Yale University Press, 1995), 18.

31. My use of the term "masses" in this paragraph is linked to the French *la foule*, the crowd, which was used with simultaneous apprehension, fear, and fascination in late nineteenth- and early twentieth-century France. See Robert A. Nye, *The Origins of Crowd Psychology: Gustave Le Bon and the Crisis of Mass Democracy in the Third Republic*, Sage Studies in 20th-Century History 2 (London: Sage, 1975); and Susanna Barrows, *Distorting Mirrors: Visions of the Crowd in Late Nineteenth-Century France* (New Haven, CT: Yale University Press, 1981).

32. Marc Décimo suggested to me that such popular publications were the most likely sources for Duchamp's knowledge of contemporary developments in astronomy and geography (personal communication, August 20, 2011).

33. Housefield and Davis, "Joseph Cornell."

34. Born in Berlin, Humboldt traveled internationally for his work and was especially well received in France. From 1830 to 1848, Humboldt was based in Paris, having lived there with his brother on previous occasions. Humboldt's major publications were all published first in Paris, mostly in French.

35. Lotte Kellner, *Alexander von Humboldt* (London: Oxford University Press, 1963),

199, as cited by Geoffrey J. Martin, *All Possible Worlds: A History of Geographical Ideas*, 4th ed. (Oxford: Oxford University Press, 2005), 118.

36. James Joyce, *A Portrait of the Artist as a Young Man* (Boston: Huebsch, 1916), 11–12.

37. Sometimes referred to as “mathematical geography,” the conjoined study of terrestrial and celestial geographies, known as cosmography in earlier centuries, became more focused with the new applications of mathematics in the eighteenth century. See E. G. Forbes, “Mathematical Cosmography,” in *The Ferment of Knowledge: Studies in the Historiography of Eighteenth-Century Science*, ed. G. S. Rousseau and Roy Porter, 417–48 (Cambridge: Cambridge University Press, 1980).

38. Denis Cosgrove, *Geographical Imagination and the Authority of Images: The Hettner Lecture with Denis Cosgrove*, Hettner Lectures (Geographisches Institut Der Universität Heidelberg) (Stuttgart, Germany: Steiner, 2006), 9.

39. G. Bruno (Augustine Fouillée), *Le tour de la France par deux enfants* (Paris: Belin, 1877).

40. Jacques Ozouf and Mona Ozouf, “*Le tour de la France par deux enfants*: Le petit livre rouge de la république,” in *La République*, 291–321, vol. 1 of *Les lieux de mémoire*, ed. Pierre Nora (Paris: Gallimard, 1984).

41. Bruno, *Le tour de la France*, preface, n.p.

42. *Ibid.*, 19.

43. Ozouf and Ozouf, “*Le tour de la France*,” 298.

44. I thank M. Frédéric Vivien, mathematics professor at the Lycée Corneille, for finding Guillon’s remarks in the archives of the school. Edouard Guillon, “Discours prononcé par M. E. Guillon, à la distribution des prix du Lycée Corneille, le 31 juillet 1903,” in *Distribution solennelle des prix le vendredi 31 juillet 1903*, ed. Lycée Corneille, i–viii (Rouen, France: Imprimerie du Journal de Rouen, 1903).

45. Bernardin de Saint-Pierre was among the celebrated past graduates of the Lycée Corneille. He remains best known for his novel *Paul et Virginie* (1788), which inspired many artists including Cornell, who made multiple works inspired by the love story set in the tropics. Guillon undoubtedly borrowed the outlines of the arguments in his address from Bernardin de Saint-Pierre’s *Etudes de la nature* (1784), a natural history whose organizational schema followed aesthetic categories in addition to categories generally associated with the classification of flora, fauna, and the environment. See, in particular, volume 2 of Henri Bernardin de Saint-Pierre, *Etudes de la nature, par Jacques-Henri Bernardin de Saint-Pierre* (Paris: P.-F. Didot le Jeune, 1784).

46. Quoted from the entry for July 31, 1903, in Jennifer Gough-Cooper and Jacques Caumont, “Ephemerides on and about Marcel Duchamp and Rose Sélavy, 1887–1968,” in *Marcel Duchamp: Work and Life* (Cambridge, MA: MIT Press, 1993).

47. I thank Phillip Dennis Cate for correspondence regarding this distinct map. Director Emeritus of the Jane Voorhees Zimmerli Art Museum, Rutgers, the State University of New Jersey, Cate is a specialist of nineteenth-century French art with an emphasis on the graphic arts. Despite his expertise in works on paper from this period, he was unfamiliar with maps of France in “chessboard” or “checkerboard” form. Although references likening maps to playing boards appear occasionally in historical

writings and cartographic histories, as do maps that take such forms, this seems to be a minor concept in the history of map making. For Paris as a chessboard, see the discussion of René Clair's film *Entr'acte* (1924) later in this chapter.

48. Jorge Luis Borges, "Del rigor en la ciencia," *Los Anales de Buenos Aires* 1, no. 3 (March 1946): 53.

49. 1:40,000 scale reproductions of the Carte d'état-major were not printed until the twenty-first century, when they were prepared in the context of the exhibition *La France en relief* (January 18–February 17, 2012). For a review of this ambitious exhibition, see Victoria Sanger, "Exhibition: 'La France en relief,'" *Journal of Architecture* 18, no. 1 (2013): 115–34.

50. I am especially indebted to conversations with Cosgrove and Paula Lee for my understanding of Coronelli's globes. See Cosgrove, *Apollo's Eye*; Letort, "Les Grands globes"; Paula Young Lee, "Standing on the Shoulders of Giants: Boullée's 'Atlas' Façade for the Bibliothèque Du Roi," *Journal of the Society of Architectural Historians* 57, no. 4 (December 1998): 404–31. For views of the globes, including fine details, see the images associated with the Bibliothèque Nationale de France's online exhibition *Les globes du Roi-Soleil* (The globes of the sun king), http://expositions.bnf.fr/globes/expo_us/01.htm.

51. I thank James McManus for this information. On the history of terrestrial and celestial globes, see Edward Luther Stevenson, *Terrestrial and Celestial Globes: Their History and Construction*, 2 vols. (New Haven, CT: Yale University Press for the Hispanic Society of America, 1921).

52. Maurice Samuels, *The Spectacular Past: Popular History and the Novel in Nineteenth-Century France* (Ithaca, NY: Cornell University Press, 2004).

53. Helmut Gernsheim and Alison Gernsheim, *L. J. M. Daguerre: The History of the Diorama and the Daguerreotype* (London: Secker and Warburg, 1956); Stephen C. Pinson, *Speculating Daguerre: Art and Enterprise in the Work of L. J. M. Daguerre* (Chicago: University of Chicago Press, 2012).

54. Gernsheim and Gernsheim, *L. J. M. Daguerre*, 28.

55. *Ibid.*, 29.

56. Erkki Huhtamo, *Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles* (Cambridge, MA: MIT Press, 2013).

57. *Ibid.* In his quest to understand the Maréorama, Huhtamo has augmented his collection of archival materials about it by staging performative reconstructions of the Maréorama experience. See his "Maréorama Resurrected: An Illustrated Lecture Performance," Studio for Creative Inquiry, October 22, 2011, <http://vimeo.com/53533579>.

58. Jean-Marc Besse, *Face au monde: Atlas, jardins, géoramas*, Arts and Esthétique Collection (Paris: Desclée de Brouwer, 2003).

59. The friendship between Duchamp and Kupka has long been recognized, as has the exchanges that occurred when they were neighbors in Montmartre and Puteaux; see Ludmila Vachtová, *Frank Kupka: Pioneer of Abstract Art* (New York: McGraw-Hill, 1968), 257. Linda Henderson has done the most to investigate its significance for both artists' work. See Linda Dalrymple Henderson, "X Rays and the Quest for Invisible

Reality in the Art of Kupka, Duchamp, and the Cubists,” *Art Journal* 47, no. 4, Revising Cubism (Winter 1988): 323–40; see also Henderson, *Duchamp in Context*.

60. “Universal Geography” offered a parallel to the pursuit of a “universal history” in nineteenth- and twentieth-century scholarly pursuits. The tradition of “la géographie universelle” was especially strong in French geography, from the work of Conrad Malte-Brun (1775–1826) to the “new geography” or “la tradition vidalienne” of Paul Vidal de la Blache (1845–1918). See Martin, *All Possible Worlds*.

61. Reclus’s epigram “L’homme est la nature prenant conscience d’elle-même” translates as “Humankind is nature achieving self-consciousness,” emphasizing that human civilization is rooted in nature. On Kupka and Reclus, see Virginia Spate, “L’homme est la nature prenant conscience d’elle-même’: Spiritisme, anarchisme et érotisme dans l’œuvre de Kupka,” in *František Kupka, 1871–1957, ou l’invention d’une abstraction*, 15–23 (Paris: Musée d’Art Moderne de la Ville de Paris, 1990); and Patricia Leighton, *The Liberation of Painting: Modernism and Anarchism in Avant-Guerre Paris* (Chicago: University of Chicago Press, 2013), esp. chap. 5, “Abstracting Anarchism: František Kupka and the Project of Modernism.”

62. For an overview of Kupka’s illustrations for Reclus analyzed in relation to the artist’s larger output as illustrator, see Pierre Brullé, ed., *Vers des temps nouveaux: Kupka, œuvres graphiques, 1894–1912* (Paris: Musée d’Orsay, 2012).

63. Henderson, “X Rays”; Henderson, *Duchamp in Context*; Tomáš Pospiszyl, “Movable Neighbourhoods: Parallels in the Works of František Kupka and Marcel Duchamp,” in *Kupka: The Road to Amorpha; Kupka’s Salons, 1899–1913*, ed. Helena Musilová (Prague: Národní Galerie, 2012), 100–111.

64. John G. Hatch, “A Sense and Essence of Nature: Wave Patterns in the Paintings of František Kupka,” in *Vibratory Modernism*, ed. Anthony Enns and Shelley Trower, 145–61 (New York: Palgrave Macmillan, 2013); and Hatch, “Machian Epistemology and Its Part in František Kupka’s Painterly Cognition of Reality,” *Slovo: An Interdisciplinary Journal of Russian, Eurasian, Central and East European Affairs* 12 (2000): 51–69.

65. See my discussion of Aimé Laussedat, later in this chapter; his leadership was central to the CNAM’s expanded role in the promotion of photography as a scientific tool and the significance of collecting photography. For conversations about Laussedat and the breadth of scientific photography collected by the CNAM, I thank Marie-Sophie Corcy, Département patrimoine et conservation, Service scientifique, Conservatoire national des arts et métiers/Musée des arts et métiers. Some examples demonstrating the breadth of the CNAM collection are reproduced in Corey Keller, ed., *Brought to Light: Photography and the Invisible, 1840–1900* (San Francisco: San Francisco Museum of Modern Art, 2008).

66. On the history of the Musée des arts et métiers, see Claudine Fontanon, Michel Le Moel, and Raymond Saint Paul, eds., *Le Conservatoire national des arts et métiers au cœur de Paris: 1794–1994* (Paris: Conservatoire National des Arts et Métiers, Délégation à l’Action Artistique de la Ville de Paris, 1994).

67. On Duchamp’s time in Munich, see the essays in Helmut Friedel, Thomas Girst, Matthias Mühlhling, and Felicia Rappe, eds., *Marcel Duchamp in Munich, 1912* (Munich: Schirmer/Mosel, 2012), esp. Bogen, “Munich 1912.”

68. Floor plans of the temporary museum show that some of the largest available spaces were dedicated to a reading room and library. As an early guidebook noted, "The library of the German Museum, which is at present on the second floor of Department I (Maximilianstrasse 26), is planned as a centre of the whole physical and technical literature. It contains important works of ancient times, the modern scientific and technical literature from home and abroad, the most important special-periodicals, and all the German patent-rolls." *Deutsches Museum München: A Walk through the Collections* (Munich: Deutsches Museum, [1909-17]), 34. Floor plans precede the title page and inside cover of this document.

69. Henderson, *Duchamp in Context*, 28.

70. *Ibid.*, 175.

2. Landscapes of Chance

1. Richard Muther, *History of Modern Painting*, vol. 1 (London: Henry and Co., 1895), 204.

2. *Ibid.*, 205.

3. An emphasis on the identification of geographic sites depicted by artists, such as emerged in the work of John Rewald and Robert Herbert, has become a common approach in the history of modern landscape painting. See especially John Rewald and Museum of Modern Art (New York), *The History of Impressionism* (New York: Museum of Modern Art, 1946); Robert L. Herbert, *Impressionism: Art, Leisure, and Parisian Society* (New Haven, CT: Yale University Press, 1988); Robert L. Herbert, *Monet on the Normandy Coast: Tourism and Painting, 1867-1886* (New Haven, CT: Yale University Press, 1994); and John House, *Monet: Nature into Art* (New Haven, CT: Yale University Press, 1986). Nicholas Green's sophisticated analysis of the economics and ideologies at work in French nature tourism complements Herbert's interest in tourism and situates it in relation to the art gallery's growing significance as a venue for the display and marketing of modern art, topics complemented by the work of Robert Jensen; see Nicholas Green, *The Spectacle of Nature: Landscape and Bourgeois Culture in Nineteenth Century France* (Manchester, UK: Manchester University Press, 1990); Robert Jensen, *Marketing Modernism in Fin-de-Siècle Europe* (Princeton, NJ: Princeton University Press, 1994).

4. Kurt Badt, *John Constable's Clouds* (London: Routledge and K. Paul, 1950); Kurt Badt, *Wolkenbilder und Wolkengedichte der Romantik* (Berlin: De Gruyter, 1960); John Constable and Edward Morris, *Constable's Clouds: Paintings and Cloud Studies by John Constable* (Edinburgh: National Galleries of Scotland, National Museums and Galleries on Merseyside, 2000); Denis Cosgrove and John E. Thornes, "Of Truth of Clouds: John Ruskin and the Moral Order in Landscape," in *Humanistic Geography and Literature: Essays on the Experience of Place*, ed. Douglas Charles David Pocock, 20-46 (London: Croom Helm, 1981); John E. Thornes and John Constable, *John Constable's Skies: A Fusion of Art and Science* (Edgbaston, UK: University of Birmingham, University Press, 1999); Natter and Smola, *Wolken*.

5. Stieglitz began photographing clouds in 1922, titling the resulting images "equivalents." He continued this practice into the 1930s.

6. Quentin Bajac et al., *Dans le champ des étoiles: Les photographes et le ciel, 1850-2000* (Paris: Réunion des Musées Nationaux, 2000).

7. For a reproduction of Lord Rosse's illustration, see Michael Hoskin, ed., *The Cambridge Illustrated History of Astronomy* (Cambridge: Cambridge University Press, 1997), 254. See also Elizabeth A. Kessler, *Picturing the Cosmos: Hubble Space Telescope Images and the Astronomical Sublime* (Minneapolis: University of Minnesota Press, 2012).

8. Albert Boime, "Van Gogh's Starry, Starry Night: After the Apocalypse a Heavenly Utopia," in *Revelation of Modernism: Responses to Cultural Crises in Fin-de-Siècle Painting*, 1-51 (Columbia: University of Missouri Press, 2008); Joachim Pissarro, *Van Gogh and the Colors of the Night* (New York: Museum of Modern Art, 2008); Albert Boime, "Van Gogh's Starry Night: A History of Matter and a Matter of History," *Arts* 59, no. 4 (1984): 86-103.

9. Among geographers and cartographers, "ground truth" is generally opposed to the conceptualized, abstracted, or misinformed information present in maps and in data from geographical information systems (GIS) or remote sensing, including satellite photography with its inherent imprecisions.

10. I thank Jackie Monnier for sharing generations of the Duchamp family photograph albums with me (August 2011) and for pointing out the resemblance of young Duchamp's paintings to the landscape in period and recent photographs.

11. See especially the research compiled by Michael Taylor for the 2009 Philadelphia exhibition about *Etant donnés* and the 2010 exhibition/symposium on Duchamp and the Forestay waterfall. Michael R. Taylor, ed., *Marcel Duchamp: Etant Donnés* (Philadelphia: Philadelphia Museum of Art, Yale University Press, 2009); Stefan Banz, ed., *Marcel Duchamp and the Forestay Waterfall* (Zurich: JRP/Ringier, 2010).

12. Duchamp, *Salt Seller*, 36. For the recurrences of the French *voie lactée* in his notes, see the original in Marcel Duchamp and Michel Sanouillet, *Marchand du sel* (Paris: Le Terrain Vague, 1958), 49, 54, 64.

13. Duchamp, *Salt Seller*, 78-79.

14. Duchamp, Apollinaire, Picabia, and Buffet traveled by automobile to Etival in the Jura mountains, a distance of approximately four hundred kilometers from Paris.

15. I thank my colleague Susan Kaiser for this suggestion. Although beyond the scope of this work, the connections between Duchamp's readymades and Le Play's investigations of labor, especially household economy, merit further consideration.

16. Willem Bürger (Theophile Thoré), *Salons de W. Burger, 1861 à 1868*, 2 vols. (Paris: Librairie Jules Renouard, 1870), 1:292. The inclusion of the term "paysagisme" in many editions of Littré's renowned dictionary would have made it readily available to Duchamp. Littré defined the term as a neologism, attributed to Bürger, referring to the "ensemble (or totality) of landscape paintings, [and] tendencies of painters of landscapes." Emile Littré, *Dictionnaire de la langue française: Supplément renfermant un grand nombre de termes d'art, de science, d'agriculture, etc., et de néologismes de tous genres appuyés d'exemples* (Paris: Hachette, 1883), 257.

17. Bürger, *Salons de W. Burger*, 292-93.

18. Duchamp, *Salt Seller*, 125.

19. According to Duchamp's recollections, payment did not necessarily find its way to the artists to whom it was due. See Cabanne, *Dialogues with Marcel Duchamp*. Humorous cartoons fill the early pages of the Duchamp *catalogue raisonné*; see Arturo Schwarz and Marcel Duchamp, *The Complete Works of Marcel Duchamp*, 3rd rev. and exp. ed., 2 vols. (New York: Delano Greenidge Editions, 2000).

20. Leighton, *Liberation of Painting*, 1. Leighton quotes Duchamp's brother Jacques Villon, whose Montmartre apartment Duchamp shares in the early years of the century when both artists contributed drawings to the humorous publications that filled modern newsstands. "In this period, the influence of the journals on art is incontestable. Thanks to them, painting was liberated more rapidly from academicism. Above all, one can't compare the attitude of the journals with those of today. The press had a progressive spirit and the drawings were not made as now, but with love." Leighton, *Liberation of Painting*, 1.

21. Charles Baudelaire, "De l'essence du rire et généralement, du comique dans les arts plastiques," in *œuvres complètes*, ed. Claude Pichois, 525-63 (Paris: Gallimard/Bibliothèque de la Pléiade, 1976). Baudelaire's essay, written in 1852, was first published in 1855. Henri Bergson, *Le rire: Essai sur la signification du comique* (Paris: Alcan, 1924). Bergson's essay appeared originally as three installments in the *Revue de Paris*: February 1, February 15, and March 1, 1900.

22. Like all who would study Duchamp's notes and boxes in depth, I am indebted to the scholarship of Ecke Bonk and Francis Naumann. Ecke Bonk, *Marcel Duchamp, the Box in a Valise: De ou par Marcel Duchamp ou Rose Sélavy; An Inventory of an Edition* (New York: Rizzoli, 1989); Naumann, *Marcel Duchamp*.

23. This summary analysis of Leonardo da Vinci, Duchamp, and facsimiles is based on a large literature; see James Housefield, "The Nineteenth-Century Renaissance and the Modern Facsimile: Leonardo Da Vinci's Notebooks, from Ravaisson-Mollien to Péladan and Duchamp," in *The Renaissance in the Nineteenth Century*, ed. Yannick Portebois and Nicholas Terpstra, 73-88 (Toronto: University of Toronto Press, 2003).

24. Poet and statesman Paul Valéry was one remarkable exception, reordering his life in response to the notebooks. Beginning in the late nineteenth century, he wrote the first of his influential essays on Leonardo, *Introduction à la méthode de Léonard de Vinci* (1895). Valéry dedicated the private hours of work between awakening (at 4:00 a.m.) and breakfasting to writing and sketching in his uniquely personal journals. He continued this daily practice throughout his life, producing 261 known notebooks or cahiers in which science mingles with art, literature, philosophy, and general observations. Although Valéry organized the cahiers meticulously, and at times used them as a site for working through questions that relate to his larger literary life, he appears to have been uninterested in publishing them during his lifetime. When the volumes were published posthumously, they appeared in both typescript and facsimile editions.

25. Françoise Le Penven, *L'art d'écrire de Marcel Duchamp: A propos de ses notes manuscrites et de ses boîtes* (Rayon Art. Nîmes, France: Chambon, 2003).

26. Exposition surréaliste des objets, Galerie Charles Ratton, May 22-29, 1936. Sotheby's documented the object's exhibition history and provenance: Sotheby's, "100

Books, Manuscripts, Documents and Objects from the Pierre Leroy Collection, #97; Raymond Roussel, *Etoile cosmique*, July 29, 1923,” accessed October 31, 2015, <http://www.sothebys.com/>.

27. There is no evidence which performance Duchamp attended although, despite his later recollections, he most certainly attended Roussel’s play before traveling to Munich. See Calvin Tomkins, *Duchamp: A Biography* (New York: Henry Holt, 1996), 90–93. Gough-Cooper and Caumont associate their extended descriptive analysis of *Impressions d’Afrique* with June 10, 1912, the closing performance of its run at the Théâtre Antoine. Gough-Cooper and Caumont, “Ephemerides.”

28. Francis M. Naumann and Hector Obalk, *Affectionately, Marcel: The Selected Correspondence of Marcel Duchamp* (Ghent, Belgium: Ludion Press, 2000), 283–84. Following the lead of Caroline Cros, I have substituted “physioplactic” for “physico-plastic” in this quotation. Caroline Cros, *Marcel Duchamp* (London: Reaktion Books, 2006), 30.

29. For an overview of Max Verworn’s impact on the study of prehistoric art, see Moses Barasch, *Modern Theories of Art*, vol. 2: *From Impressionism to Kandinsky* (New York: New York University Press, 1998), 233–40.

30. L. Laloy, “Max Verworn: Kinderkunst und Urgeschichte (L’art des enfants et l’art préhistorique),” *L’Anthropologie* 18 (1907): 653–54.

31. Verworn’s interest in the art of children, and in distinctions between the conscious and unconscious in art, would have resonated with the artists connected to Wasily Kandinsky and the Blue Rider Group in Munich. This possible connection during Duchamp’s Munich sojourn merits further consideration, though it is beyond the scope of this book.

32. Michel Carrouges, *Les machines célibataires* (Paris: Arcanes, 1954); Linda Dalrymple Henderson, “Raymond Roussel’s *Impressions d’Afrique*, Marcel Duchamp’s *Large Glass*, and the Lure of Early Twentieth-Century Science and Technology,” in *Locus Solus: Impressions of Raymond Roussel*, ed. Museo Nacional Centro de Arte Reina Sofia, 146–60 (Madrid: Turner Publications, 2011).

33. Henri Bergson, *Le rire*.

34. Marie J. A. Colombet, *L’humour objectif: Roussel, Duchamp, “Sous le capot”: L’objectivation du surréalisme* (Paris: Publibook, 2008), 241–44.

35. Terry Hale and Andrew Hugill, “The Science Is Fiction: Jules Verne, Raymond Roussel, and Surrealism,” in *Jules Verne: Narratives of Modernity*, ed. Edmund J. Smyth, 122–41 (Liverpool, UK: Liverpool University Press, 2000).

36. In both tales, Western characters marooned by shipwreck in an unknown land encounter “savages.” As Hale and Hugill point out, these so-called savages turn out to be “more civilized than themselves.” The shipwrecked passengers then must organize for self-protection. “In Verne’s story, this turns into a series of social and political experiments, each system failing until anarchism (which Verne sees as freedom from government, rather than insurrection) finally triumphs. In Roussel’s version, the ‘rules’ explored apparently govern the ordering and construction of entertainments devised to while away the time until a ransom is paid.” “Science Is Fiction,” 129.

37. Hale and Hugill, “Science Is Fiction,” 129.

38. Indeed, “Africa” may have been chosen because of the pun created through Roussel’s self-funded publication of the book; the French phrase indicating a publication paid for at the author’s own expense is an *impression à fric*.

39. Hale and Hugill, “Science Is Fiction,” 138.

40. John Ashbery, *Selected Prose* (Ann Arbor: University of Michigan Press, 2005), 34. In the essay “On Raymond Roussel,” Ashbery referred to French philosopher Blaise Pascal. Pascal’s mathematical and theological investigation of the infinitely large and the infinitely small led him to conclude that, without religion, humanity is lost and purposeless in the vast gulf between. An essential figure in the French intellectual tradition, Pascal’s essays would have been standard fare for schoolchildren in the modern educational system of the Republic; his *Pensées* were reissued in several editions during the early twentieth century. See Raymond Francis, *Les Pensées de Pascal en France de 1842 à 1942: Essai historique et critique* (Paris: Nizet, 1959).

41. Illustration fifty-nine from *Nouvelles impressions d’Afrique* also anticipates the elegant drawings of the night sky made by Vija Celmins since 1973. See Vija Celmins, Anne Seymour, and Adrian Searle, *Vija Celmins Drawings of the Night Sky* (London: Anthony d’Offay Gallery, 2001).

42. Raymond Roussel, *Nouvelles impressions d’Afrique* (Paris: Librairie Alphonse Lemerre, 1932), 225.

43. “Madeleine” refers to Madeleine Pagès, whom he generally called “Lou.” Claude Debon’s detailed analysis of the calligrammes’ transformation across many states of manuscript and publication is an essential tool for understanding these visual-verbal works. On “Madeleine,” see the color illustration (p. 163) and the analyses (pp. 212–13) in Claude Debon, *Calligrammes dans tous ses états: Edition critique du recueil de Guillaume Apollinaire* (Clamart, France: Calliopées, 2008).

44. *Ibid.*, 352–53.

45. On Duchamp’s *Tonsure*, see chapter 4.

46. Guillaume Apollinaire, “La chanson du mal-aimé,” *Mercure de France*, May 1, 1909.

47. James Johnson Sweeney, “Eleven Europeans in America,” *Bulletin of the Museum of Modern Art* 13, nos. 4/5 (1946): 21.

48. “Son grand poème typographique et cosmogonique.” Paul Claudel, *œuvres complètes de Paul Claudel* (Paris: Gallimard, 1950), 22.

49. Also known as the Plough, the Big Dipper is formed of a group of seven stars within the constellation Ursa Major, the Great Bear.

50. Rudolf E. Kuenzli and Francis M. Naumann, *Marcel Duchamp: Artist of the Century* (Cambridge, MA: MIT Press, 1989), 29–31.

51. Schwarz and Duchamp, *Complete Works*, 594–96.

52. Cabanne, *Dialogues with Marcel Duchamp*, 47.

53. Anne D’Harnoncourt et al., *Marcel Duchamp: A Retrospective Exhibition Organized by the Philadelphia Museum of Art and the Museum of Modern Art, New York* (Philadelphia: Philadelphia Museum of Art, 1973), 273–74.

54. James W. McManus demonstrated the likelihood that Duchamp had used waxed thread in his efforts to re-create the *Stoppages*; I thank him for this information.

55. Roger Shattuck, *The Innocent Eye: On Modern Literature and the Arts* (New York: Farrar, Straus and Giroux, 1984), 102.

56. Marks's painting *Science Is Measurement* may be seen in the collections of the Royal Academy, London.

57. Dawn Ades, Neil Cox, and David Hopkins, *Marcel Duchamp*, World of Art Series (London: Thames & Hudson, 1999), 79.

58. See Henderson, *Duchamp in Context*. Housefield and Molderings argued independently that the metric monuments in the landscape of Paris, such as the one at rue de Vaugirard, are among the cultural manifestations of metricity to which Duchamp's *Stoppages* refer. James Housefield, "The Case of Marcel Duchamp: The Artist as Traveller and Geographer," in *Geographies of Modernism*, ed. Peter Brooker and Andrew Thacker, 99–111 (Abingdon, UK: Routledge, 2005); Herbert Molderings, *Duchamp and the Aesthetics of Chance: Art as Experiment* (New York: Columbia University Press, 2010).

59. See Chalgrin's original drawing in the Archives nationales, Paris: "Dessin de CHALGRIN pour un projet de mètre en marbre (18 septembre 1795)," Archives nationales, F 121298. For a narrative description and historical analysis of the standard meter on the streets of Paris, see Fernand Gerbaux, *Le mètre de marbre de la rue de Vaugirard* (Paris: Firmin-Didot, 1904 [orig. 1902]).

60. Gerbaux, *Le mètre de marbre*, 22, quotes the phrase *monuments métriques*, presumably from Chalgrin, though without attribution.

61. *Ibid.*

62. A graduate of the Ecole des chartes, Gerbaux dedicated his life to the Archives nationales. His publications could be counted on one hand. Alongside his research on the meter of the rue de Vaugirard, a historical study of a 1789 map of France is his most important work.

63. See the entry for May 19, 1914, in Gough-Cooper and Caumont, "Ephemerides."

64. On March 17, 1912, Duchamp traveled by rowboat down the Seine from Puteaux to Paris, to deliver *Nude Descending a Staircase* to the Salon des Indépendents, on the Quai d'Orsay (Paris). The following day, his brothers tell him that the hanging committee (including themselves, in addition to Albert Gleizes and Jean Metzinger) has rejected his submission; he must return to reclaim the painting. Kieran Lyons, "Military Avoidance: Marcel Duchamp and the 'Jura-Paris Road,'" *Tate Papers*, no. 5 (Spring 2006), <http://www.tate.org.uk/>.

3. Aviation and Substitution

1. As Helen Molesworth and others have argued, changing circumstances impact the meanings of the readymades; Duchamp's late-career reproductions of readymades assume meanings and functions that differ from the "originals" that disappeared some forty years before. Helen Molesworth, ed., *Part Object Part Sculpture* (University Park: Pennsylvania State University Press, 2005).

2. Michel Leiris, "Arts et métiers de Marcel Duchamp," *Fontaine: Revue Mensuelle de la Poésie et des Lettres Françaises* 10, no. 54 (1946): 188–93.

3. *Sérum physiologique* or isotonic saline solution, would have been sealed in glass to maintain its sterility. Given Duchamp's penchant for punningly relating his name to salt (Marcel, sel), it is possible that he could have deliberately selected this over another ampoule. *Sérum physiologique* is generally made by diluting sodium chloride with distilled water to create a 0.9 percent salt solution.

4. "The plinth in sculpture, like the frame in painting, establishes a mystical boundary between ordinary space occupied with things and artistic space filled by rarified visual material." Dorothy Kosinski, ed., *Matisse: Painter as Sculptor* (New Haven, CT: Yale University Press, 2007), 64. See also Penelope Curtis, *Sculpture, 1900-1945: After Rodin* (Oxford: Oxford University Press, 1999); and Alexandra Gerstein, *Display and Displacement: Sculpture and the Pedestal from Renaissance to Post-Modern* (London: Courtauld Institute of Art Research Forum, 2007).

5. On Kant and the Puteaux Cubists, and on Duchamp's multifaceted assault on "taste," see Henderson, *Duchamp in Context*. For two other approaches to Duchamp and Kant, see Thierry de Duve, *Kant after Duchamp* (Cambridge, MA: MIT Press, 1996); and Mileaf, *Please Touch*.

6. Immanuel Kant, *Kant's Kritik of Judgment* (London: Macmillan, 1914), 100.

7. *Ibid.*, 61. According to Kant, whereas judgments of the senses depend upon an individual's sensory perceptions (i.e., registering a pleasing smell or appearance of the rose through sensory recognition), aesthetic judgments—judgments of taste—depend upon agreement by more than one person.

8. In 1881, De Dion opened a shop selling scientific toys in Montmartre's passage Léon (near 3, rue Polonceau). Bouton had his own studio for the manufacture of scientific toys on the rue de la Chapelle, approximately a kilometer away. Viollet discusses this, as well as the political dimensions of De Dion's career. See Sandrine Viollet, *Le tour de France cycliste: 1903-2005* (Paris: L'Harmattan, 2007), 24. My understanding of the history of De Dion-Bouton is indebted Anthony Bird, *De Dion-Bouton: First Automobile Giant*, Ballantine's Illustrated History of the Car (New York: Ballantine, 1971); and Pierre Boyer, *De Dion-Bouton: De l'automobile—à l'aéronautique* (Paris: Rétroviseur, 1995). Although De Dion-Bouton employed a trademark shaped like a spoked wheel, their identity is more associated with the flowing letters of their typographic logo.

9. Duchamp's brothers and Kupka resided in the cottages and garden at 7, rue Lemaître, Puteaux, about a kilometer from De Dion-Bouton's factories and offices. Because of urban transformations launched by the 1958 development plans of the Etablissement public d'aménagement for the area of la Défense, the landscape of Puteaux today scarcely resembles what Duchamp and his brothers knew. Quai National has since been rechristened quai de Dion-Bouton, in recognition of the factories; rue des Pavillons is now the rue des Coutures, while the rue Ernest and rue Lemaître were razed and covered with new structures.

10. For an example of the De Dion-Bouton company's advertising celebrating its interchangeable parts, and illustrating bicycle handlebars and forks, see the full-page advertisement "Les Bicyclettes De Dion-Bouton," *L'Illustration*, February 25, 1911, "Annonces," 7. I thank Bruno Guasconi of the website Tonton Vélo, who generously shared his images from the Cycles De Dion Bouton 1911 catalog.

11. Tom D. Crouch, *The Bishop's Boys: A Life of Orville and Wilbur Wright* (New York: Norton, 1989).

12. On Picasso and the Michelin pamphlet, see Linda Nochlin, "Picasso's Color: Schemes and Gambits," *Art in America* 68, no. 10 (1980): 77-83, 105-23. My understanding of the larger scope of this and related Michelin campaigns is indebted to pages 80-90 of Antoine Champeaux, *Michelin et l'aviation, 1896-1945: Patriotisme industriel et innovation* (Panazol, France: Lavauzelle-Graphic Editions, 2006).

13. A large literature connects exhibitionary practices of world's fairs with those of emerging museums of science and technology. For the standard overview, see Edward Alexander, "The Museum of Science and Technology," in *Museums in Motion*, 61-75 (Nashville: American Association for State and Local History, 1979).

14. Background on Ader for this chapter comes primarily from Biruta Kresling, "La 'Chauve-souris' de Clément Ader," *La Revue Musée des arts et métiers*, no. 13 (December 1995): 23-31.

15. Many of those who launched the aviation salons were involved in the automotive salons, where they exhibited aircraft including balloons and Ader's plane. See the *Rapport officiel sur la première exposition internationale de locomotion aérienne organisée par l'Association des industriels de la locomotion aérienne au Grand-Palais (octobre 1909)* (Paris: Librairie Aéronautique, 1910).

16. On July 25, 1909, Blériot achieved the first airplane crossing of the English Channel, an event that garnered tremendous news coverage. Parisian newspaper *Le Matin* purchased the plane and donated it to the Conservatoire national des arts et métiers (CNAM) in an astute publicity event that culminated in this ceremonial procession. The CNAM marked the centennial of Blériot's achievement with a special exhibition, *L'aviation de l'exploit: 1909, Louis Blériot traverse la Manche* (June 23-November 1, 2009).

17. Guillaume Apollinaire and Peter F. Read, *The Cubist Painters: Aesthetic Meditations* (Berkeley: University of California Press, 2004), 75. See especially Read's commentary (179-84). Apollinaire here refers to the story told by Giorgio Vasari, in *Lives of the Painters* (1550; 1568), about the role played by Cimabue's painting in religious processions of the Renaissance.

18. Maurice Mallet, perhaps the least recognized name of those listed here, was a cofounder of the Société Mallet, Mélandri et de Pitray (December 1896); known after 1909 as manufacturers of aeronautic balloons for use by amateurs, they changed their name to Zodiac in 1911 and later became known for the manufacture of sporting boats. Like De Dion-Bouton, Mallet's Zodiac factories were located in Puteaux.

19. Glenn Benge, *Antoine-Louis Barye: Sculptor of Romantic Realism* (University Park: Pennsylvania State University Press, 1984). Expanding Barye's commercial gambit, the U.S. artist Frederic Remington achieved financial success by converting his two-dimensional magazine sketches into large paintings and sculptural tableaux, mass-producing tabletop sculptures to supply the growing audience for his works.

20. Rémy G. Saisselin, *The Bourgeois and the Bibelot* (New Brunswick, NJ: Rutgers University Press, 1984).

21. Albert Elsen discusses the reproductions and court case, acknowledging French sculptor Jean-Antoine Houdon's related experience: "Houdon had a similar expe-

rience with his marble *Le Baiser Donné* (1778), whose eroticism greatly pleased his audience, and versions of it were made in terra-cotta, porcelain, and bronze.” Albert Elsen, *Rodin’s Art: The Rodin Collection of Iris and B. Gerald Cantor Center of Visual Arts at Stanford University* (New York: Oxford University Press, 2003), 214–15.

22. Duchamp’s notes refer to Rodin’s *Kiss*, whose contours he modified slightly in a late etching *Selected Details after Rodin* (1968).

23. My understanding of Bartholdi has been enriched by the opportunity to visit archives and see his works on site, including visits to the Musée Bartholdi, Colmar and the Fonds Bartholdi, Musée des arts et métiers, and to see sculptures on the streets of Belfort, Colmar, and Paris. Although I knew of her excellent article in the journal *October*, I learned of Darcy Grigsby’s book only in late revisions to this manuscript. Darcy Grimaldo Grigsby, *Colossal: Engineering the Suez Canal, Statue of Liberty, Eiffel Tower, and Panama Canal; Transcontinental Ambition in France and the United States during the Long Nineteenth Century* (New York: Periscope, Prestel, 2012); Darcy Grimaldo Grigsby, “Geometry/Labor = Volume/Mass?” *October*, no. 106 (Fall 2003): 3–34.

24. The Place Denfert-Rochereau is thus a locus of puns made material: the name itself was changed as a homonymic variation on the name of a site known since the time of the ancient Romans, while the lion gives form to the metaphorical nickname of Denfert-Rochereau himself.

25. Paul-Joseph-Victor Dargaud (1850–1921), *Statue of Liberty on the rue de Chazelles* (ca. 1884), Musée Carnavalet, Paris.

26. The popular etymology of the term “gadget” is cited in June Hargrove and Pierre Provoyeur, eds., *Liberty: The French-American Statue in Art and History* (New York: Harper & Row, 1986), 284.

27. On the underside of these figures the phrase “AMERICAN COMMITTEE MODEL” was stamped. Edward L. Kallop, *Images of Liberty: Models and Reproductions of the Statue of Liberty, 1867–1917* (New York: Christie, Manson & Woods, 1985).

28. See Kallop, *Images of Liberty*; and Carol A. Grissom, *Zinc Sculpture in America, 1850–1950* (Newark: University of Delaware Press, 2009), 200–201.

29. Catherine Hodeir, “The French Campaign,” in *Liberty: The French-American Statue in Art and History*, ed. June Hargrove and Pierre Provoyeur, 121–39 (New York: Harper & Row, 1986). Reports of Bartholdi’s widow’s donation appeared in the popular artistic and scientific press. See, for instance, the unsigned entries on page 275 in “*Courrier de l’art*,” *L’Art: Revue Mensuelle Illustrée* (1907).

30. Replicas of *Liberty* have continued to proliferate since 1900. The case of the Hanoi replica is a fascinating one. Erected in 1887 as part of a French colonial exhibition there, it was pulled down during anticolonial protests in 1945. See Mark Bradley, *Imagining Vietnam and America: The Making of Postcolonial Vietnam, 1919–1950* (Chapel Hill: University of North Carolina Press, 2000).

31. I thank Dennis Cate for correspondence regarding the history of these tourist objects.

32. Quoted and translated by Grigsby, *Colossal*, 139, from the unpaginated text of Paul Bluysen, *Paris en 1889: Souvenirs et croquis de l’exposition* (Paris: P. Arnould, 1890).

33. I thank Tim Dunn of the Bekonscot Model Village (near London, England),

for his insights into the history of miniature parks and for the suggestion that their miniaturization may be related to Western fascination with Japanese bonsai gardening. Dunn reports that Stephen Levrant, principal architect of Heritage Architecture (London), is working on a book on the history of miniature parks and related models. Personal communication, September 23, 2012.

34. Donald G. Mitchell, "In and About the Fair," *Scribner's Monthly* 13, no. 1 (November 1876): 115-24.

35. Albert Maumené, *Les arbres nains japonais: Leur formation au Japon, leur utilisation et leur traitement en Europe* (Paris: Librairie Horticole, François Tedesco, and l'Art Nouveau Bing, 1902); Paul Maury, "La botanique à l'Exposition universelle: Les arbres nains de Japon," *Le Naturaliste* 11, no. 33 (1889): 141-43.

36. Sarah J. Moore, *Empire on Display: San Francisco's Panama-Pacific International Exposition of 1915* (Norman: University of Oklahoma Press, 2013). For additional analysis of the display, see Bill Brown, "Science Fiction, the World's Fair, and the Prosthetics of Empire, 1910-1915," in *Cultures of United States Imperialism*, ed. Amy Kaplan and Donald E. Peace (Durham, NC: Duke University Press, 1993). See also the official booklet published to accompany the exposition: Panama-Pacific International Exposition Company, *The Panama Canal at San Francisco* (San Francisco: Author, 1915).

37. Moore notes that the Underwood Company advertised the gargantuan model as "an exact reproduction, although 1,728 times larger." Moore, *Empire on Display*, 127. Historian Emil Salvini notes that the colossal typewriter was moved to Underwood's Products and Progress Pavilion at Atlantic City in 1916, after the close of the exposition and before being relocated to Convention Hall some twenty years later, subsequently turned to scrap metal, and melted down for the war effort during World War II. Emil R. Salvini, *Boardwalk Memories: Tales of the Jersey Shore* (Guilford, CT: Globe Pequot Press, 2005), 116. Other world's fairs featured monumental enlargements of everyday objects. Chaim Rosenberg records the massively scaled Garland Stove designed by the Michigan Stove Company that served as a twenty-five-foot-tall pavilion sheltering an exhibit of the company's wares. Chaim M. Rosenberg, *America at the Fair: Chicago's 1893 World's Columbian Exposition* (Mount Pleasant, SC: Arcadia, 2008), 105.

38. Huhtamo, *Illusions in Motion*.

39. E. Nesbit, *The Magic City* (London: Macmillan, 1910).

40. Julia Briggs, *A Woman of Passion: The Life of E. Nesbit, 1858-1924* (London: Hutchinson, 1987). Briggs discusses the exhibition on pages 350-51 and reproduces a photo of Nesbit and her *Magic City* model at the exhibit on the unpaginated page of plates opposite 220. I thank Max Davis-Housefield for this reference and for the suggestion that I consider Nesbit's *Magic City*.

41. *Ibid.*, 324-25.

42. E. Nesbit, *Wings and the Child; or, The Building of Magic Cities . . . with Pictures by George Barraud and from Photographs* (London: Hodder & Stoughton, 1913).

43. Jenny Bavidge, "Treasure Seekers in the City: London in the Novels of E. Nesbit," in *The Swarming Streets: Twentieth-Century Literary Representations of London*, ed. Lawrence Phillips (Amsterdam: Rodopi, 2004); Jenny Bavidge, "Exhibiting Childhood: E. Nesbit and the Children's Welfare Exhibition of 1912-3," in *Childhood in Edwardian*

Fiction: Worlds Enough and Time, ed. A. E. Gavin and A. F. Humphries (Basingstoke, UK: Palgrave Macmillan, 2009).

44. Annie Gérin, "Scholar's Choice: Le jeu des monuments de Paris," Canadian Centre for Architecture (CCA), June 2009, <http://www.cca.qc.ca/>.

45. See David Harvey, *Consciousness and the Urban Experience: Studies in the History and Theory of Capitalist Urbanization* (Baltimore: Johns Hopkins University Press, 1985); Konvitz, *Cartography in France*; and Norman J. W. Thrower, *Maps and Civilization: Cartography in Culture and Society* (Chicago: University of Chicago Press, 1996).

46. Phillip Dennis Cate, ed., *The Graphic Arts and French Society, 1871-1914* (New Brunswick, NJ: Rutgers University Press, Jane Voorhees Zimmerli Art Museum, 1988).

47. For one example of this approach, see Richard L. Kagan, *Urban Images of the Hispanic World, 1493-1793* (New Haven, CT: Yale University Press, 2000).

48. Duchamp, *Salt Seller*; Marcel Duchamp, *Marcel Duchamp: à l'infinif* (London: Typosophic Society, 1999).

49. Katherine Kuh, *The Artist's Voice: Talks with Seventeen Artists* (New York: Harper & Row, 1962), 83.

50. Henderson, *Duchamp in Context*.

51. Quoted in David Pinkney, *Napoleon III and the Rebuilding of Paris* (Princeton, NJ: Princeton University Press, 1958).

52. Bloy's phrase referred to the Eiffel Tower as "cette quincaillerie superbe." Léon Bloy, "La Babel de fer," in *Belluaires et porchers* (Paris: Stock, 1905), 20-28.

53. My argument that the readymades represent the landscape of Paris monuments builds on Jeffrey Weiss's observation that the forms of *Bottle Rack* and *Bicycle Wheel* parallel those of the Eiffel Tower and the Ferris wheel. Jeffrey S. Weiss, *The Popular Culture of Modern Art: Picasso, Duchamp, and Avant-Gardism* (New Haven, CT: Yale University Press, 1994).

54. Craig Adcock, "Marcel Duchamp's Approach to New York: 'Find an Inscription for the Woolworth Building as a Ready-Made,'" *Dada/Surrealism* 14 (1985): 52-65.

55. William Camfield, *Marcel Duchamp: Fountain* (Houston: Houston Fine Art Press, 1989).

56. David Harvey, *Consciousness*; and David Harvey, *Paris: Capital of Modernity* (London: Routledge, 2003).

57. Raymond Jonas, *France and the Cult of the Sacred Heart: An Epic Tale for Modern Times* (Berkeley: University of California Press, 2000).

58. Raymond Jonas, "Sacred Tourism and Secular Pilgrimage: Montmartre and the Basilica of Sacré-Cœur," in *Montmartre and the Making of Mass Culture*, ed. Gabriel Weisberg, 94-119 (New Brunswick, NJ: Rutgers University Press, 2001), 111.

4. From Marcel to Rose

1. I am indebted to the late Roger Shattuck for discussions of Man Ray's experience as mapmaker. Roger Shattuck, "Candor and Perversion in No-Man's Land," in *Perpetual Motif: The Art of Man Ray*, ed. Merry Foresta, 311-33 (Washington, DC: National Museum of American Art, Smithsonian Institution, 1988), 313. Before achieving

success as a photographer, Man Ray was known for his paintings. Francis Naumann situates Man Ray's period of cartographic employment amidst the young artist's activities in support of his decision to become a painter, in defiance of his parents' desire for him to be an architect. See Francis M. Naumann, *Conversion to Modernism: The Early Work of Man Ray* (New Brunswick, NJ: Rutgers University Press, Montclair Art Museum, 2003), 13.

2. Mason Klein, ed., *Alias Man Ray: The Art of Reinvention* (New Haven, CT: Yale University Press, 2009), 10.

3. "In the *Notebooks* of Leonardo da Vinci, one finds the same humorous idea of the utilization of the fall of dust as a measure of time," Marcel Jean remarked in his *History of Surrealist Painting*, trans. Simon Watson Taylor (New York: Grove Press, 1960 [1959]), 101. Jean Clair, Theodore Reff, Dalia Judovitz, and Linda Henderson all have commented significantly on the possible implications of Leonardo's notes about dust for Duchamp. Jean Clair, "Duchamp, Léonard, la tradition maniériste," in *Marcel Duchamp: Tradition de rupture ou rupture de la tradition?* 117–56 (Paris: Union Générale d'Éditions, 1979); Theodore Reff, "Duchamp and Leonardo: L.H.O.O.Q.-Alikes," *Art in America* 65 (January 1977): 83–93; Henderson, *Duchamp in Context*; Dalia Judovitz, *Unpacking Duchamp: Art in Transit* (Berkeley: University of California Press, 1995). Judovitz cites Leonardo on landscapes of dust: "When a table is struck in different places, the dust that is upon it is reduced to various shapes of mounds and tiny hill-ocks" (255n53).

4. Information about the photograph's lengthy exposure and the "desertscape" quote come from page 114 of Roxana Marcoci, *The Original Copy: Photography of Sculpture, 1839 to Today* (New York: Museum of Modern Art, 2010).

5. *Littérature* (new series, no. 5), October 1922. The French legend reads, "Voici le domaine de Rose Sélav / Comme il est aride—comme il est fertile—/ Comme il est joyeux—Comme il est triste!"

6. Diana K. Davis, *Resurrecting the Granary of Rome: Environmental History and French Colonial Expansion in North Africa* (Athens: Ohio University Press, 2007).

7. I thank meteorologist Guillaume Séchet of the French television station BFMTV for the historical climate data he has made available on a public website. Guillaume Séchet, "Les chroniques météo de l'année 1921," Météo-Paris, accessed October 14, 2015, <http://www.meteo-paris.com/>.

8. Harriet Janis and Sidney Janis, "Marcel Duchamp, Anti-Artist," *View* 5, no. 1 (1945): 54. This essay arguably constituted the most complete English-language analysis of Duchamp's career available before Robert Lebel's 1959 monograph.

9. On Mars and the geographic imagination, see K. Maria D. Lane, *Geographies of Mars: Seeing and Knowing the Red Planet* (Chicago: University of Chicago Press, 2011).

10. "What I Am" first appeared in a pamphlet printed in conjunction with the exhibition Man Ray, *An Exhibition, Retrospective and Prospective, of the Works of Man Ray, Institute of Contemporary Arts, 17–18 Dover Street, London W1 from Tuesday March 31 to Saturday April 25, 1959* (London: Institute of Contemporary Arts, 1959). Reprinted in Jules Langsner and Maurice Tuchman, *Man Ray: An Exhibition* (Los Angeles: Los Angeles County Museum of Art, 1966).

11. Aimé Laussedat, *La métrophotographie* (Paris: Gauthier-Villars, 1899), 5.
12. I thank Marie-Sophy Corcy, of the Conservatoire national des arts et métiers, for conversations that helped me understand the great impact Laussedat had on the preservation of materials from the early history of photography, and for his strong leadership and public voice as director of the Conservatoire.
13. See Borges, “Del rigor en la ciencia.”
14. Barbara Beth Zabel, *Assembling Art: The Machine and the American Avant-Garde* (Jackson: University Press of Mississippi, 2004), 50.
15. On *Trans atlantique*, see Klein, *Alias Man Ray*, 61; Dickran Tashjian, *A Boatload of Madmen: Surrealism and the American Avant-Garde, 1920–1950* (London: Thames and Hudson, 1995), 92–93; Zabel, *Assembling Art*, 179–80.
16. At some time after making the 1921 assemblage *Trans atlantique*, Man Ray re-titled the photograph *New York 1920*, also naming the photo *Trans atlantique*.
17. Such maps, especially the pocket-sized books offering a “plan de Paris par arrondissement,” were commonly produced in late nineteenth-century Paris and remain in print today. Vilmin, Taride, Leconte, and other publishing houses issued books like these. Man Ray clipped a part of one showing public transportation routes highlighted in red. Such paths could have marked lines for tram or omnibus travel or for the subway (Métro).
18. Willard Bohn, *Apollinaire and the International Avant-Garde* (Albany: State University of New York Press, 1997).
19. “London Gives Read and Crew of Nc-4 a Great Reception,” *New York Times*, June 2, 1919.
20. “Alcock and Brown Get London Ovation—Carried to Automobiles on Shoulders of Soldiers on Arrival from Dublin,” *New York Times*, June 18, 1919; “Alcock and Brown Fly across Atlantic: Captain Alcock’s Own Narrative of His Flight from Newfoundland to Ireland,” *New York Times*, June 16, 1919; “Capt. Alcock and Lieut. Brown Knighted,” *Flight*, June 26, 1919; “The Transatlantic Flight,” *Flight*, June 19, 1919.
21. “Transatlantic Vickers-Vimy at South Kensington,” *Flight*, December 18, 1919.
22. Hallion estimated Ader’s French government contract from 1892, at 550,000 francs, to be the equivalent of 2.2 million dollars in the year 2003. Richard P. Hallion, *Taking Flight: Inventing the Aerial Age from Antiquity through the First World War* (New York: Oxford University Press, 2003), 132.
23. Kresling, “La ‘Chauve-souris.’”
24. Hallion, *Taking Flight*, 135.
25. Martin Peter and Jean-Pierre Cuisinier, *La bataille du vent* (Paris: CSTB, 2007). I thank Sylvain Yeatman-Eiffel for correspondence related to Eiffel’s aerodynamics lab. My treatment of Eiffel relies in part on an unpublished 1962 manuscript by designer André Granet (who married Eiffel’s niece, Geneviève Solles, in 1922), excerpted in a website maintained by Eiffel’s heirs. Alexandre Gustave Eiffel, *Etudes sur l’hélice aérienne faites au laboratoire d’Auteuil* (Paris: E. Chiron, 1921); Alexandre Gustave Eiffel, *La résistance de l’air et l’aviation: Expériences effectuées au laboratoire du Champ-de Mars* (Paris: Dunod et Pinat, 1911); Alexandre Gustave Eiffel, *Inauguration du nouveau laboratoire aérodynamique* (Paris: L. Maretheux, 1912); Alexandre Gustave Eiffel, *Travaux*

scientifiques exécutés à la tour de 300 mètres de 1889 à 1900 (Paris: L. Maretheux, 1900); Claudine Fontanon, “La Naissance de l’aérodynamique expérimentale et ses applications à l’aviation, une nouvelle configuration socio-technique (1904-1921),” in *Histoire de la mécanique appliquée: Enseignement, recherche et pratiques mécaniciennes en France après 1880*, ed. Claudine Fontanon, 57-88 (Fontenay-Saint-Cloud, France: ENS Editions, 1998); André Granet, “Laboratoire aérodynamique Eiffel,” Association des descendants de Gustave Eiffel, accessed October 14, 2015, <http://www.gustaveeiffel.com/>.

26. Eiffel tested wings or planes manufactured by many of the best-known names in French aviation, including Louis Blériot, Robert Esnault-Pelterie, Henri Farman, Pierre Levasseur, Charles and Edouard Newport, Gabriel Voisin, and Wilbur and Orville Wright.

27. Eiffel’s laboratory has performed important aerodynamic research continuously from 1912 until today. In advance of its centennial anniversary celebration, the laboratory was renovated and restored, with exceptional public visits made possible in 2012.

28. As cited by Dalia Judovitz, *Drawing on Art: Duchamp and Company* (Minneapolis: University of Minnesota Press, 2010), 96.

29. I thank James McManus for encouraging me to consider the reference to the Marcel wave. McManus suggests that photographs of Rose Sélavy revealing a wavy patch of hair that emerges from beneath her hat make a sly pun regarding “fad” and style.

30. Steven Zdatny, *Hairstyles and Fashion: A Hairdresser’s History of Paris, 1910-1920* (Oxford, UK: Berg, 1999), 20-26.

31. *Petit Larousse illustré* (Paris: Larousse, 1906), 70.

32. On the “star system,” see Richard deCordova, *Picture Personalities: The Emergence of the Star System in America* (Urbana: University of Illinois Press, 1990); Richard Dyer, *Heavenly Bodies* (London: Routledge, 1986); Richard Dyer, *Stars* (London: British Film Institute, 1998); and Richard Dyer, *Only Entertainment* (London: Routledge, 2002).

33. The complex history of the visibility of photographs of Rose Sélavy is unraveled succinctly by James McManus. See McManus, *Inventing Marcel Duchamp*, 79n91.

34. Michael D. Garval, *Cléo de Mérode and the Rise of Modern Celebrity Culture* (Farnham, UK: Ashgate, 2013).

35. *Ibid.*, 18.

36. Information in this paragraph is based on Bernard Marcadé, *Marcel Duchamp: La vie à crédit; Biographie*, *Grandes biographies* (Paris: Flammarion, 2007), 191-96.

37. *Wid’s Daily* (aka *Film Daily*) 5, no. 114 (August 31, 1918): 16-17.

38. Naumann and Obalk, *Affectionately, Marcel*, letter on pp. 53-56; translation quoted is from p. 56.

39. Perret was not alone in trying this “readymade” approach to war cinema; D. W. Griffith’s highly successful *Hearts of the World* (1918) similarly incorporated actual footage of troops in war to blur the lines between fiction and documentary. See Richard Polenberg, *Fighting Faiths: The Abrams Case, the Supreme Court, and Free Speech*

(Ithaca, NY: Cornell University Press, 1999), 84; also note the discussion of Liberty Bonds on the previous pages, in light of Perret's innovative marketing campaigns for the film and Duchamp's later interest in marketing systems.

40. On film stills as vehicles for public displays of gendered identities, see especially Vanessa Rocco, "The New Woman in Weimar Film Stills," in *The New Woman International: Representations in Photography and Film from the 1870s through the 1960s*, ed. Elizabeth Otto and Vanessa Rocco, 213-30 (Ann Arbor: University of Michigan Press, 2011).

41. I thank Bill Hollingshead for many wonderful stories such as this that he has shared regarding his father's photographic practices, especially those as the chief assistant in Steichen's studio. Steichen and Duchamp, who met in various cultural circles in New York, were both close with Brancusi in the teens and twenties.

42. For his early remarks on the American woman, see Duchamp's interview with Bessie Breuer, published unsigned as "The Nude Descending a Staircase Man Surveys Us," *New York Tribune*, September 12, 1915.

43. The stuff of tabloid news, the case was understandably given serious coverage by Hollywood journalists; the *Los Angeles Times* chronicled the court proceedings regularly from January 19, 1921, through December 17, 1921.

44. I thank Susan Kaiser for discussions about Rose, Duchamp, and fashion, and for suggesting Berry's scholarship to me. Sarah Berry, *Screen Style: Fashion and Femininity in 1930s Hollywood* (Minneapolis: University of Minnesota Press, 1997).

45. Nancy J. Troy, *Couture Culture: A Study in Modern Art and Fashion* (Cambridge, MA: MIT Press, 2003). See especially Troy's chapter "The Readymade and the Genuine Reproduction," 266-326.

46. *Ibid.*, 291.

47. Illustrated in Paul Morand and Brassai, *Paris de nuit: 60 photos inédites de Brassai publiées dans la collection "Réalités," sous la direction de J. Bernier*, Collection "Réalités" (Paris: Arts et Métiers Graphiques, 1933).

48. Throughout this chapter I use the terms "haircut," "coiffure," and "tonsure" interchangeably, mindful of their differences. "Tonsure" generally carries specific ecclesiastical meanings, while "coiffure" is associated with modern hairdressing and fashion. For notable exceptions to the limited studies on Duchamp's haircut, see Giovanna Zapperi, "Marcel Duchamp's Tonsure: Towards an Alternate Masculinity," *Oxford Art Journal* 30, no. 2 (2007): 289-303; and James W. McManus, "Not Seen and/or Less Seen: Hiding in Front of the Camera," in Goodyear and McManus, *Inventing Marcel Duchamp*, esp. 154-59.

49. Robert Lebel, *Sur Marcel Duchamp* (Paris: Trianon Press, 1959), 24.

50. On Duchamp's participation in the Lebel project, see Paul B. Franklin, "1959: Headline Duchamp," *Etant donné Marcel Duchamp* 7 (2006): 140-75.

51. These include those reproduced in Schwarz and Duchamp, *Complete Works*, 672-74.

52. On the Boeuf sur le Toit and *L'œil cacodylate*, see Merry Foresta, ed., *Perpetual Motif: The Art of Man Ray* (Washington, DC: National Museum of American Art, Smithsonian Institution, 1988), 131.

53. My use of “gesture” is indebted to Brian O’Doherty, *Inside the White Cube: The Ideology of the Gallery Space* (Berkeley: University of California Press, 1999).

54. See, for instance, Schwarz and Duchamp, *Complete Works*, 673, which follows Anne d’Harnoncourt, Kynaston McShine, Philadelphia Museum of Art, Museum of Modern Art (New York), and Art Institute of Chicago, *Marcel Duchamp: A Retrospective Exhibition Organized by the Philadelphia Museum of Art and the Museum of Modern Art, New York* (Philadelphia: Philadelphia Museum of Art, 1973), 18.

55. McManus, “Not Seen and/or Less Seen,” 79n100.

56. *Ibid.* The letters, identified by Jeanne Brun, are in the Tristan Tzara collection at the Bibliothèque Jacques Doucet, Paris.

57. Henry Norris Russell, “The Heavens in September, 1921: The Unidentified Celestial Object Observed from Mount Hamilton,” *Scientific American* 125, no. 10 (September 3, 1921): 168.

58. “Informations,” *La Nature* 49, no. 2/no. 2474, supplement (September 3, 1921): 67.

59. *Ibid.* *New York Times* reports also linked the Heidelberg sighting with that made at the Lick Observatory; see “German Reports Earth Hit New Comet’s Tail,” *New York Times*, August 13, 1921, and “Wreath of Light Bands in Tail of a Comet,” *New York Times*, August 14, 1921.

60. “Informations,” *La Nature*. *La Nature* cites *Nature* (London) of August 18, 1921, and the *English Mechanic* of August 19, 1921, as sources for its report; other international publications reported the celestial event.

61. “Hunt ‘Lick Star’ in Europe,” *New York Times*, August 21, 1921.

62. “Comet Hunt Urged Upon Star-Gazers,” *New York Times*, October 30, 1921.

63. “Report of the Comet Medal Committee,” *Publications of the Astronomical Society of the Pacific* 34, no. 197 (1922): 72.

64. John Ruskin, *Ruskin on Pictures*, vol. 2: *Academy Notes* (London: G. Allen, 1902),

53. Henry Wallis’s painting was titled *Chatterton* (1856), Tate London; variants of the painting exist in the Yale Center for British Art and the Birmingham Museums and Art Gallery.

65. To pinpoint two references from a vast array of popular culture, Blondie and Neil Young offer examples as rock musicians in the 1980s who were simultaneously serious and tongue-in-cheek. Writing for the band Blondie, Deborah Harry and Chris Stein composed the Romantically titled “Die Young Stay Pretty” for the album *Eat to the Beat* (1979). That same year, Neil Young’s song “My, My, Hey, Hey (Out of the Blue)” opened the album *Rust Never Sleeps* (1979), including the lyrics “It’s better to burn out / than to fade away.” These late twentieth-century musical examples offer two of the countless recurrent references to “meteoric” Romanticism in popular culture since Duchamp’s time.

66. Michel Sanouillet and Anne Sanouillet, *Dada in Paris* (Cambridge, MA: MIT Press, 2009).

67. Théophile Silvestre wrote the phrase “qui avait le soleil dans la tête et des orages dans le cœur” in a paragraph mourning the death of Delacroix. Théophile Silvestre, *Eugène Delacroix: Documents nouveaux* (Paris: Michel Lévy, 1864), 63.

68. Paul Signac, *D'Eugène Delacroix au néo-impresionisme* (Paris: Floury, 1921). Adolphe Tabarant, "Autour du Sardanapale," *Bulletin de la Vie Artistique* (1921); "Le 'Sardanapale' entre au Louvre," *Bulletin de la Vie Artistique* (1921).

69. *Petit Larousse illustré*, 70, notes both definitions, the latter being a figurative usage.

70. Denis Diderot and Jean d'Alembert, *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers* (Bern, Switzerland: Société Typographique, 1781), 3:715.

71. *Ibid.*, 8:583.

72. *Petit Larousse illustré*, 203.

73. Pierre-Charles Le Monnier, *La théorie des comètes, où l'on traite du progrès de cette partie de l'astronomie: Avec des tables pour calculer les mouvements des comètes, du soleil, and des principales étoiles fixes* (Paris: Chez Gab. Martin, J. B. Coignard, & les Frères Guerin, 1743), i–ii.

74. *Ibid.*, iv.

75. Camille Flammarion, "History of a Comet," in *Stories of Infinity: Lumen—History of a Comet—In Infinity* (Boston: Roberts, 1873), 180, 187, 188–89, 197.

76. *Ibid.*, 180.

77. Duchamp, *Salt Seller*, 30.

78. Quoted in Robert Motherwell, *The Dada Painters and Poets: An Anthology* (Cambridge, MA: Harvard University Press, 1989), 247.

79. Quoted in *Ibid.*

80. Sara Schechner Genuth, *Comets, Popular Culture, and the Birth of Modern Cosmology* (Princeton, NJ: Princeton University Press, 1997).

81. "Comet's Poisonous Tail: Yerkes Observatory Finds Cyanogen in Spectrum of Halley's Comet," *New York Times*, February 8, 1910.

82. Camille Flammarion, *La fin du monde* (Paris: Ernest Flammarion, 1894).

83. On Mars in the popular and scientific imagination of Duchamp's time, see K. Maria D. Lane, *Geographies of Mars: Seeing and Knowing the Red Planet* (Chicago: University of Chicago Press, 2011).

84. Flammarion, "History of a Comet," 239.

85. Camille Flammarion, *Popular Astronomy* (New York: Appleton, 1890), 515–16.

86. See the illustration "Kometen" reproduced in Genuth, *Comets*, 64; compare, especially, Duchamp's photos with the right center image reproduced by Genuth, showing Donati's Comet on October 2, 1858.

87. Flammarion, *Popular Astronomy*, 515.

88. Peter Dronke, *The Medieval Poet and His World, Storia e Letteratura, raccolta de studi e testi*, vol. 164 (Rome: Storia e Letteratura, 1984), 439. Dante's concluding line is an adaptation of Boethius's phrase "caelo imperitans amor." This line of connections, from Boethius to Dante to Duchamp, was suggested by Octavio Paz, *Marcel Duchamp: Appearance Stripped Bare* (New York: Arcade, 1990), 162.

89. *Petit Larousse illustré*, 70.

90. Diderot and d'Alembert, *Encyclopédie*, 8:581.

91. I thank Anne Goodyear for suggesting the link between Duchamp's haircut, the "Lick Star," and a cowlick. In French, the cowlick is referred to as a "mèche sur le

front.” The term “mèche” also denotes a wick such as that of a candle or certain gas lamps, while “être de mèche avec quelqu’un” refers to being in cahoots with someone.

92. Roberta Etter and Stuart Schneider, *Halley's Comet: Memories of 1910* (New York: Abbeville, 1985). A collection of comet ephemera, this text reproduces bawdy comet postcards in English, French, and German that play with the punning nature of the comet's tail.

93. Albert Barrère, *Argot and Slang: A New French and English Dictionary of the Cant Words, Quaint Expressions, Slang Terms and Flash Phrases Used in the High and Low Life of Old and New Paris* (London: privately printed at the Chiswick Press by C. Whittingham and Co., 1887), 377.

94. Carol P. James, “Duchamp's Silent Noise/Music for the Deaf,” in *Marcel Duchamp: Artist of the Century*, ed. Rudolf E. Kuenzli and Francis M. Naumann, 106–26 (Cambridge, MA: MIT Press, 1989), 112–13.

95. Peter Read, “The *Tzanck Check* and Related Works by Marcel Duchamp,” in *Marcel Duchamp: Artist of the Century*, ed. Rudolf E. Kuenzli and Francis M. Naumann, 95–105 (Cambridge, MA: MIT Press, 1989); and Sébastien Rongier, “Duchamp, Du Poil, et Cie,” in *Marcel Duchamp and Eroticism*, ed. Marc Décimo (Cambridge, UK: Cambridge Scholars, 2007).

96. Helen Molesworth, “Rose Sélavy Goes Shopping,” in *The Dada Seminars*, ed. Leah Dickerman and Matthew Witkovsky, 173–89 (Washington, DC: National Gallery of Art, 2005), 181.

97. Duchamp, *Salt Seller*, 26. On Duchamp's reference to the Jura-Paris Road, see also Henderson, *Duchamp in Context*, esp. 39; and James Housefield, “The Modern Artist as Traveler and Geographer: The Case of Marcel Duchamp,” in *Geographies of Modernism*, ed. Peter Brooker and Andrew Thacker, 99–111 (London: Routledge, 2005), esp. 103. I thank Douglas Kahn for conversations regarding the “headlight child” in its larger cultural context, including Duchamp's interest in Roussel, which is treated in chapter 2.

98. The story of comets as identifying marks is too vast to encompass here. Many familiar comet marks remain current today, including Comet Cleanser, sold by Proctor & Gamble since 1956, that promises to make surfaces sparkle like comet dust. Other aspects of comets' currency included their potential speed, longevity, dependability (noted by their predictable recurrence), and their connection with a generalized cosmic/celestial sensibility that is perennially newsworthy.

99. Molesworth asserts that the trademark was established in 1905, without reference to specific marks or source bibliography; Molesworth, “Rose Sélavy,” 178.

100. Celestial references proliferated among the first trademarks registered in the United States. The significance of astronomy and geography for trademarks may be measured by their prominence as the first defined category of the U.S. Patent and Trademark Office (USPTO) Design Search Code Manual. This, the official manual to classify trademarks for registration, is also consulted to determine the unique qualities of a mark in searches to be conducted before making application to register a trademark. Category 01 of the Manual classifies “celestial bodies, natural phenomena, [and] geographical maps”; section 01.01 refers to “stars, comets.” See “USPTO Design

Search Code Manual—Category 01,” USPTO, accessed September 30, 2012, <http://tess2.uspto.gov/>.

101. Richard Abel, *The Red Rooster Scare: Making Cinema American* (Berkeley: University of California Press, 1999), 15–19.

102. *Harper's Guide to Paris and the Exposition of 1900* (New York: Harper, 1900), 61.

103. *Paris-Parisien* (Paris: Paul Ollendorff, 1896), 451. Other comet breweries, bars, and brasseries existed in France, perhaps including more in Paris.

104. Camille Flammarion, *The Wonders of the Heavens* (New York: Scribner, 1871), 206–7.

105. Juan Antonio Ramirez, *Duchamp: Love and Death, Even* (London: Reaktion, 1998), 39–41.

106. Roberta J. M. Olson, *Fire and Ice: A History of Comets in Art* (Washington, DC: National Air and Space Museum, Smithsonian Institution, 1985), 73.

107. Roberta J. M. Olson and Jay M. Passachoff, *Fire in the Sky: Comets and Meteors, the Decisive Centuries, in British Art and Science* (Cambridge: Cambridge University Press, 1998).

108. This significance and nationalism are both vivid in the discussion of William Herschel's discovery of Uranus, which he initially recorded as a possible comet. For a highly readable account of this well-known story, see Richard Holmes, *The Age of Wonder: How the Romantic Generation Discovered the Beauty and Terror of Science* (New York: Random House, 2009), esp. chap. 2, “Herschel on the Moon,” 60–124.

109. David H. Levy, *David Levy's Guide to Observing and Discovering Comets* (Cambridge: Cambridge University Press, 2003), 25–29. On Messier, see also Jean-Paul Philbert, *Charles Messier: Le furet des comètes* (Sarreguemines, France: Editions Pieron, 2000).

110. François Arago, *Tract on Comets* (Boston: Hilliard, Gray, 1832). From 1839 to 1942, the site where the meridian crosses the boulevard Arago was marked by a bronze statue of Arago. Rather than restore the statue destroyed during World War II, the Association Arago commissioned artist Jan Dibbets to create a conceptual monument to Arago (1987–94), in the form of medallions set in the streets of Paris. Ambassade des Pays-Bas à Paris, France (Embassy of the Netherlands, Paris, France), “Hommage à Arago de Jan Dibbets,” accessed October 30, 2015, <http://lafrance.nlabassade.org/>.

111. Schwarz and Duchamp, *Complete Works*, 715.

112. *Ibid.*, 707.

113. Susan Glover Godlewski, “Warm Ashes: The Life and Career of Mary Reynolds,” *Art Institute of Chicago Museum Studies* 22, no. 2 (1996): 102–29, 96.

114. I thank Jack Perry Brown, director of the Ryerson and Burnham Libraries, for facilitating access to the Mary Reynolds Collection and for so hospitably helping me to better understand Reynolds's life and work.

115. For a discussion of Doucet's patronage of Duchamp, see chapter 4 of Naumann, *Marcel Duchamp*. See also the correspondence between Duchamp and Doucet, in Naumann and Obalk, *Affectionately, Marcel*.

116. To my knowledge, this aspect of Duchamp's work in the realm of design has

yet to be discussed. Jacques Mauny, "Concerning Bourdelle, Legrain and Jacques Doucet," *New York Times*, December 22, 1929.

117. Godlewski, "Warm Ashes."

118. Janine Mileaf, "Boxes, Books, and the *Boîte-en-Valise*," In *A Transatlantic Avant-Garde: American Artists in Paris, 1918-1939*, ed. Sophie Lévy and Christian Derouet, 162-72 (Berkeley: University of California Press, 2003); Mileaf, *Please Touch*.

119. Many, including Duchamp's friend the artist and composer John Cage, have identified the linguistic and formal investigations of Duchamp and Joyce as paradigmatic of an essential sensibility within modernism. Artist William Anastasi and others have speculated about possible connections between Duchamp and Joyce. Joyce once identified a connection when remarking on the cover of the Winter 1937 issue of the little magazine *Transition*. Remarking upon the 1917 Duchamp readymade *Comb* on its cover and Joyce's manuscript inside, the latter said, "The comb with the thick teeth was used to comb out *Work in Progress* [which later assumed the title *Finnegan's Wake*]." Sarat Maharaj, "A Monster of Veracity, a Crystalline Transubstantiation: Typo-translating the Green Box," in *The Duchamp Effect*, ed. Martha Buskirk and Mignon Nixon, 61-91 (Cambridge, MA: MIT Press, 1996), 68. Outside of this statement, Reynolds herself appears to be the most substantial connection between the two that has been confirmed.

120. Quoted in Schwarz and Duchamp, *Complete Works*, 727. To date, no photographic documents have come to light that might reveal more about the interior of Duchamp's room in Reynolds's Paris home. After her death in 1950, the rue Hallé—including Reynolds's home—was destroyed by the wrecking balls and bulldozers of developers. It seems that no trace of Duchamp's room was saved. Suquet's account thus stands as the best documentation of a distinct space.

121. Guy Debord, "Introduction to a Critique of Urban Geography (Introduction à une critique de la géographie urbaine," *Les Lèvres Nues*, no. 6 (1955), trans. Ken Knabb, Situationist International Online, <http://www.cddc.vt.edu/>.

122. I have learned much about the Situationists from the excellent work of Simon Sadler. See Simon Sadler, *The Situationist City* (Cambridge MA: MIT Press, 1998).

5. Interstellar Voyages and Surrealist Geographies

1. I thank Didier Ottinger, assistant director of the Centre national d'art et de culture Georges-Pompidou, Musée national d'art moderne, Paris, for correspondence relating to the Surrealists and the *train fantôme* (personal communication, February 10-11, 2014). The Pompidou exhibit *Surréalisme et l'objet* ran from October 30, 2013, to March 3, 2014. See also Gérard Durozoi, *Histoire du mouvement surréaliste* (Paris: Editions Hazan, 1997), 472.

2. Lewis Kachur, *Displaying the Marvelous: Marcel Duchamp, Salvador Dalí, and Surrealist Exhibition Installations* (Cambridge, MA: MIT Press, 2001).

3. Laurence Bertrand Dorléac, Jacqueline Munck, and Musée d'art moderne de la Ville de Paris, *L'Art en guerre, France, 1938-1947* (Paris: Paris Musées, 2012).

4. I thank Christina Cogdell for conversations related to these aspects of Art Deco

and acknowledge that a fuller treatment of these iconographies remains outside the scope of this book.

5. Griffiths, *Shivers Down Your Spine*, 125.

6. Kreymborg and Duchamp knew each other through the intersection of many social circles in New York from 1915. The Arensbergs, Duchamp's patrons, provided financial backing for Kreymborg to launch his little magazine of poetry, *Others*. Duchamp met Man Ray through Kreymborg when the poet moved from Greenwich Village to Ridgefield, New Jersey. See Allan Antliff, *Anarchist Modernism: Art, Politics, and the First American Avant-Garde* (Chicago: University of Chicago Press, 2007); and Jeremy Braddock, *Collecting as Modernist Practice* (Baltimore: Johns Hopkins University Press, 2012).

7. Alfred Kreymborg, *The Planets: A Modern Allegory* (New York: Farrar & Rinehart, 1938).

8. "Fashion: From the Paris Mid-Season," *Vogue*, June 15, 1937, 52-53.

9. Couderc would become the first director of the planetarium when it was rebuilt inside the Palais de la découverte in 1952. He became known as a promoter of astronomy to rival Flammarion in the previous century. Paul Couderc, *Parmi les étoiles* (Paris: Editions Bourrelie, 1938).

10. Little has been written about the significant role envisioned for contemporary art in the Palais de la découverte; my understanding of this comes primarily from unpublished materials in their archives and photothèque. See also the discussion of works commissioned for the palais, in Christopher Green, *Art in France, 1900-1940*, Yale University Press Pelican History of Art (New Haven, CT: Yale University Press, 2000). For a discussion of Léger's painting *Le transport des forces*, see Rosi Huhn, "Art et technique: La lumière," in *Paris 1937: Cinquantenaire de l'Exposition internationale des arts et des techniques dans la vie moderne*, ed. Bertrand Lemoine and Philippe Rivoirard (Paris: Institut Français d'Architecture: Paris Musées, 1987), 400-401.

11. James McManus, personal communication, January 18, 2012.

12. Jacques Mauny, "Bird's Eye View of Paris Exposition," *New York Times*, July 25, 1937, 137.

13. Elena Filipovic, "Surrealism in 1938: The Exhibition at War," in *Surrealism, Politics and Culture*, ed. Raymond Spiteri and Donald Lacoss, 179-203 (Burlington, VT: Ashgate, 2003); James D. Herbert, *Paris 1937: Worlds on Exhibition* (Ithaca, NY: Cornell University Press, 1998); Alyce Mahon, *Surrealism and the Politics of Eros, 1938-1968* (New York: Thames & Hudson, 2005).

14. The 1937 Exposition Internationale des Arts et Techniques dans la Vie Moderne celebrated the power of artificial illumination through electric lighting as displayed in many ways. Colorful nightly lighting of the fairgrounds (especially its fountains), accompanied by live or recorded music, presented an early example of the entertaining spectacle later to be known as *son et lumière*. Sponsorship from the Mazda lamp company made it possible to take such entertainments on the road and thereby deliver a similarly dramatic experience to people across France with what they called the "Tour de France de la Lumière"—a lighting tour whose name evoked the cross-country bicycle race known as the Tour de France—in 1937. On April 30 of that year, a convoy of

trucks loaded with lighting equipment set out from the Tuileries gardens in Paris for a tour to visit 426 cities before the end of 1937. Where possible, the Mazda lighting tour illuminated monuments with colored lights at night and used photography to document these; ninety-eight of these images of landmarks and memorials appeared in a slim promotional volume produced in early 1938, after the conclusion of the national tour. Compagnie des Lampes Mazda, *Quelques illuminations du Tour de France de la Lumière* (Paris: Compagnie des Lampes Mazda, 1938). Mazda was a household name in Paris of the 1930s. André Breton's novel *Nadja* reproduced a photograph of the Mazda lamp posters that must have seemed ubiquitous on the streets of Paris at that time. The Surrealists chose Mazda-brand flashlights to illuminate their 1938 exhibition, and Lewis Kachur notes that a Mazda advertisement was pinned to the wall next to the first mannequin encountered by audiences entering the section of that display dedicated to "the most beautiful streets of Paris" (a mannequin by Hans Arp). The nocturnal photography (described in this chapter) featured in the Surrealist magazine *Minotaure* echoes the documentation of the Tour de France de la Lumière. Kachur, *Displaying the Marvelous*, 43.

15. Bajac et al., *Dans le champ des étoiles*.

16. Erich Mendelsohn, *Amerika: Bilderbuch eines architekten* (Berlin: Rudolf Mosse, 1928 [orig. 1925]).

17. Morand and Brassai, *Paris de nuit*. I thank Kim Sichel for conversations about Brassai; her tutelage has guided my understanding of *Paris de nuit* and its impact; see, especially, Kim Sichel, "Paris la nuit, Paris le jour," in Brassai: *Paris le Jour, Paris la Nuit*, ed. Musée Carnavalet, 6–25 (Paris: Paris Musées, 1988). Brassai's book had an enormous impact on the subsequent history of visual culture, internationally, ranging from English photographer Bill Brandt's nocturnal experiments to the stage sets and cinematography of Stanley Donen's Hollywood film *Funny Face* (1957).

18. Germaine Krull, *100 x Paris* (Berlin-Westend: Verlag der Reihe, 1929); Kim Sichel, *Germaine Krull: Photographer of Modernity* (Cambridge, MA: MIT Press, 1999); André Kertész and Pierre Mac Orlan, *Paris vu par André Kertész*, Editions d'histoire et d'art, publiées sous la direction de J. et R. Wittmann (Paris: Librairie Plon, 1934); Ian Walker, *City Gorged with Dreams: Surrealism and Documentary Photography in Interwar Paris*, Critical Image (Manchester, UK: Manchester University Press, 2002).

19. See the primary documents of critical reviews anthologized in Bruce Altshuler, *Salon to Biennial: Exhibitions That Made Art History* (London: Phaidon, 2008).

20. For an illustration of the cartoon, see *ibid.*, 288.

21. See, for instance, the lithographic print by Honoré Daumier, *Déménagé! . . . et pour me payer trois termes . . . il me laisse un faux col, non blanchi!* (Gone! . . . instead of paying the three months of past due rent . . . he leaves me an unwashed collar!), published as plate 5 of the series *Locataires et propriétaires* that appeared in *Le Charivari* (Paris) March 12, 1847 (Delteil #1598).

22. Although the Exposition sur l'habitation was short lived, lasting from 1934 to 1939, it solidified the salon's goals of presenting tools for artful living that ranged from kitchen gadgets and small appliances to the design of interior spaces.

23. The Musée Dupuytren, in the Couvent des Cordeliers, was located near Sylvia

Beach's Shakespeare and Co. bookstore, a noted gathering place of expatriates and the literary avant-garde, first located at 8, rue Dupuytren. René Abelanet and Paul P. de Saint-Maur, "Le Musée Dupuytren, passé et présent," *Histoire des Sciences Médicales* 25, no. 2 (1991): 127-32.

24. The Salle Gaveau was (and, at the time of this writing, remains) located at 45, rue de la Boétie. On the Soirée Dada, see, for instance, Sanouillet and Sanouillet, *Dada in Paris*.

25. Although the Bœuf sur le Toit has moved repeatedly, it has always remained in the eighth arrondissement. At the time of the 1938 Surrealist exhibition, it would have been at the location opened in 1936, at 41 bis, avenue Pierre 1^{er} de Serbie. On the Bœuf sur le Toit, see Maurice Sachs, Jean Hugo, and Pierre-André Benoit, *Au temps du Bœuf sur le Toit* (Paris: Ed. de la Nouvelle Revue Critique, 1939).

26. *Le Figaro* (Paris), January 16, 1938, 2: "Le clou sera l'automate Enigmarelle, construit en 1900 par l'ingénieur américain Ireland, et que l'on pourra voir en fausse chair et en faux os traverser à minuit et demi l'exposition." (The highlight would be the automaton Enigmarelle, built in 1900 by the American engineer Ireland, and who [Enigmarelle] will appear to walk through the exhibit at half-past midnight in his false flesh and bones.)

27. Edmond Labbé, *Ministère du commerce et de l'industrie: Exposition internationale des arts et techniques dans la vie moderne* (1937), vol. 6: *La Section française: Les groupes et les classes, groupes vi à x* (Paris: Imprimerie Nationale, 1939), 92-93. Labbé's original capitalized the word "Electricity," to personify it.

28. My understanding of the Van der Graaf generator at the palais is based on period documents by Lazard, Perrin, and Tesla. See André Lazard, "Le Palais de la découverte scientifique: Le grand générateur électrostatique à 5 millions de volts," *La Science et la Vie*, no. 51 (April 1937): 279-84; Jean Perrin, "Présentation du Palais de la découverte," in *Livre d'or officiel de l'Exposition internationale des arts et techniques dans la vie moderne*, 86-89 (Paris: Editions SPEC, 1937); and Nikola Tesla, "Possibilities of Electro-Static Generators," *Scientific American* 150, no. 3 (1934): 63-65, 132-34.

29. Lazard, "Le Palais"; Perrin, "Présentation"; Charles de Saint-Cyr, *L'Exposition: Ouvrage illustré contenant l'examen critique de tous les palais et pavillons et l'étude du Palais de la découverte salle par salle* (Paris: Librairie des Provinces de France, 1937). Perrin's official essay asserts that Irène Joliot-Curie and Lazard conceived and created the device, although Saint-Cyr and others attribute it to Joliot-Curie's husband, Frédéric Joliot-Curie.

30. R. Chenevier, "La science à l'exposition," *L'Illustration*, May 29, 1937.

31. *Ibid.* Emphasis added. Chenevier refers to the renowned Parisian magician Jean Eugène Robert-Houdin (1805-71), an illusionist whose great fame later inspired Erik Weisz, an aspiring young magician, to change his own name to Harry Houdini (1874-1926).

32. *Frankenstein* had been released in Paris during 1932, followed by its sequel *Bride of Frankenstein* in 1935.

33. Gérard Namer, "Les imaginaires dans l'Exposition de 1937," *Cahiers Internationaux de Sociologie* 70 (1981): 35-62. Robert Wiene's *Cabinet of Doctor Caligari*

(1920; French release, 1922) and Fritz Lang's *Metropolis* (1927), both internationally successful when first released, blended elements of horror and science fiction with social commentary.

34. The electrostatic generator was disassembled in 1942, at the height of World War II, and put into storage.

35. Saint-Cyr, *L'Exposition*, 158.

36. *Ibid.*

37. On February 14, 1933, l'Observatoire de Paris launched the service of the "Horloge parlante," or talking clock, using the recorded voice of Marcel Laporte, aka "Radiolo," a radio personality. Laporte's distinct male voice was later replaced by a female voice. The talking clock was promoted by Esclangon, head of the observatoire.

38. Saint-Cyr, *L'Exposition*.

39. Robert Lencement, "Astronomy at the Palace of Discovery in Paris," *Popular Astronomy* 48 (December 1940): 191.

40. The design and construction of the Palais de la découverte was the achievement of the architectural firm Boutterin, Debré, and Néret, principals Maurice-Jacques Boutterin (ca. 1882-1970), Germain Debré (1890-1948), and Armand Néret (dates not known).

41. While respecting their desire to remain anonymous, I thank the residents of this building who allowed me to enter the courtyard and better understand the passage of the visitors as they encountered the 1938 exhibition in Wildenstein's gallery. I know of no other analysis of this exhibition that acknowledges this passage from street to gallery. Such internal voyages characterize access to spaces within older Parisian buildings, yet they are entirely distinct from the access to more recent "storefront" gallery architecture.

42. Georges Charensoil, "Le journal de Paris," *L'Intransigeant*, January 19, 1938. Cited by Altshuler, *Salon to Biennial*, 290-91.

43. Schwarz and Duchamp, *Complete Works*, 768.

44. "La machine à faire les étoiles," *Je Sais Tout*, April 1937, 11.

45. Roger Simonet, "Paris possède enfin un 'planétaire,'" *Science and Vie*, August 1937, 106.

46. In 1922 Gamain founded the lighting company Société Gamain, specialists in re-creating daylighting conditions through artificial light. His scientific studies of light undoubtedly led to the innovative presentation of the Stellarium.

47. Gabriel Eisenmenger, "Le Planétarium et le voyage interplanétaire," *Journal des Instituteurs et des Institutrices* 83, no. 40 (June 26, 1937): 613.

48. J. H. Rosny Aîné, *Les navigateurs de l'infini, roman inédit* (Paris: Fayard, 1925).

49. Eisenmenger, "Le Planétarium," 613-14.

50. *Ibid.*, 614.

51. Filmed in Weimar Germany, the silent *Wunder der Schöpfung* was known as *Miracle de la création* for francophone distribution. In English distribution it appears to have been titled *Our Heavenly Bodies* or, alternately, *In the World of the Stars*.

52. René Descartes, *Discours de la méthode pour bien conduire sa raison, et chercher la vérité dans les sciences* (Leiden, Netherlands: I. Maire, 1637).

53. "Expression de la pensée," in *Livre d'or officiel de l'Exposition internationale des arts et techniques dans la vie moderne*, 259-61 (Paris: Editions SPEC, 1937).

54. Quoted in Henderson, *Duchamp in Context*, 77, 269n59, from the Hamilton and Hamilton *Audio Arts Magazine* cassette interview.

55. Dore Ashton, "An Interview with Marcel Duchamp," *Studio International* 171 (June 1966), 244-25. On Duchamp and Descartes, see also David Hopkins, *Marcel Duchamp and Max Ernst: The Bride Shared* (Oxford: Oxford University Press, 1998), 32-37.

56. On the 1931 exhibition, see Patricia A. Morton, *Hybrid Modernities: Architecture and Representation at the 1931 Colonial Exposition, Paris* (Cambridge, MA: MIT Press, 2000). On the French "Mission Civilisatrice," see Alice L. Conklin, *A Mission to Civilize: The Republican Idea of Empire in France and West Africa, 1895-1930* (Stanford, CA: Stanford University Press, 1997). On "la plus grande France," see Robert Aldrich, *Greater France: A History of French Overseas Expansion* (London: Macmillan, 1996).

57. "Expression de la pensée."

58. *Ibid.*

59. Walker, *City Gorged*.

60. See Florence Riou, "Jean Painlevé: De la science à la fiction scientifique," *Conserveries Mémoires*, no. 6 (March 27, 2009): 30-46. Roxane Hamery discusses the end of their relatively short-lived collaboration after Painlevé held Lotar responsible for the loss of a sequence that would have been the first film of the underwater birth of the amphipod caprelle (ghost shrimp). See Roxane Hamery, *Jean Painlevé, le cinéma au cœur de la vie*. Rennes, France: Presses Universitaires de Rennes, 2009), 61-62.

61. Hamery cites Alain Fleig about an exhibit titled "L'humour et la fantastique par la photographie" being held in the Galerie de la Pléiade, boulevard Saint-Michel, in 1935, assembling works by a diverse group including "Painlevé, Boiffard, Boucher, Brassai, Kollar, Landau, Lotar, Man Ray, Moral, Parry, Steiner, etc." Hamery, *Jean Painlevé*, 112; Alain Fleig, *Etant donné l'âge de la lumière: 1. photographie et surréalisme en France entre les deux guerres* (Neuchâtel, Switzerland: Ides et Calendes, 1997), 171-72.

62. Riou reports that screenings in the "salle de cinéma" of the palais that opened August 25, 1937, were often filled to capacity and awaiting visitors turned away. Three Painlevé films, including *Quatrième dimension*, were commissioned by the mathematics section (with *De la similitude des longueurs et des vitesses* and the social Darwinist-titled *Images mathématiques de la lutte de la vie*); the fourth, by the astronomy section.

63. Florence Riou, "Le cinéma à l'Exposition internationale de 1937: Un média au service de la recherche scientifique," 1895, *Revue de Recherche sur l'Histoire du Cinéma*, no. 58 (October 2009): 31-56." Founded by Flammarion, SAF launched its *cinemathèque* in early 1937. SAF gathered information about astronomical cinematography and published lists of film titles in their *Bulletin*.

64. I thank Florence Riou for correspondence regarding her research, and for sharing her work generously. See Riou, "Jean Painlevé"; Riou, "Le cinéma à l'Exposition"; Florence Riou, "Le cinéma, ou comment raconter la science au public de l'Exposition de 1937," *Culture and Musées*, no. 18 (December 2011): 129-50.

65. Langevin, cited by Riou, "Le cinéma, ou comment raconter."

66. I have adapted Shattuck's translation and have adopted traditional spelling

instead of the capital letters etched on the walls of the Palais de Chaillot. Shattuck, *Innocent Eye*, 157.

67. Cabanne, *Dialogues with Marcel Duchamp*, 72.

68. Figure 5.15 shows a view inside one of these dioramas. Although the photograph was taken in 1952, it is consistent with, and characteristic of, the dioramas constructed before the museum's inaugural opening in 1937. I have not been able to document precisely when this model of a spiraling galaxy was installed. However, this detailed photograph reveals the simplicity of the design of these scientific models. Cardboard, plywood, paint, and cotton combine to communicate the essence of a distant galaxy.

69. On the exhibition designs of the 1940s, see Kachur, *Displaying the Marvelous*; Mahon, *Surrealism*; Alyce Mahon, "The Search for a New Dimension: Surrealism and Magic," in *The Meanings of Magic: From the Bible to Buffalo Bill*, ed. Amy Wygant, 221-34 (Oxford, UK: Berghahn Books, 2006); and T. J. Demos, *The Exiles of Marcel Duchamp* (Cambridge, MA: MIT Press, 2007).

Conclusion

1. Little has been written about this print or exhibition poster. Kieran Lyons offer a brief yet significant assessment of it, consistent with my independent association of it with French nuclear testing, in an important analysis of Duchamp's lifelong history of military avoidance. Lyons, "Military Avoidance." The print was issued as a multiple in two versions: a limited edition of four hundred prints, signed, showing imagery without text; and an advertising poster print, including details of the exhibition (*Ready-mades [sic] et éditions de et sur Marcel Duchamp*, Galerie Claude Givaudan, 201 Boulevard Saint-Germain, Paris, June 8-September 30, 1967). Bridgeman images licenses a third version that appears to have been printed for posting on the streets or for other informal distribution. That version, not included in the Duchamp catalogue raisonné, has a darker black background against which the smoke cloud has been manipulated to heighten its visibility.

2. The expression "to say the moon is made of green cheese" refers to jokes or hoaxes in both English and French language traditions.

3. Goodyear and McManus, *Inventing Marcel Duchamp*.

4. Leiris, "Arts et métiers."

5. Leiris published insightful writings about Roussel. Roussel was a family friend of Leiris's father. In addition, the older author seems to have played a catalytic role for Leiris during childhood.

6. Raymond Roussel, *How I Wrote Certain of My Books (Comment j'ai écrit certains de mes livres)*, ed. Trevor Winkfield (Cambridge, MA: Exact Change, 2005 [1935]).

7. "The Richard Mutt Case," *Blind Man*, no. 2 (May 1917): 5. This brief, unsigned essay offers the most significant early statement justifying Duchamp's readymades on the basis of choice and creating "a new thought for the object." That paragraph merits quotation in full. "Whether Mr. Mutt with his own hands made the fountain or not has no importance. He CHOSE it. He took an ordinary article of life, placed it so that its

useful significance disappeared under the new title and point of view—created a new thought for the object.”

8. On the *Marcel Duchamp Art Medal*, an edition of medals based on a lead bathtub stopper, see Schwarz and Duchamp, *Complete Works*, 843; and Judovitz, *Unpacking Duchamp*, esp. 186–94.

9. See Anne Goodyear’s emphasis on Duchamp’s active self-transformation in this series of photographs in Goodyear and McManus, *Inventing Marcel Duchamp*, 196. See also Herbert Molderings, *Marcel Duchamp at the Age of 85: An Icon of Conceptual Photography* (Cologne, Germany: Walther König, 2014).

10. Jacqueline Matisse Monnier, personal communication, Villiers-sur-Grèze, France, August 2011. Monnier’s recollection rests well in the context of scholars’ emphasis on Duchamp’s fascination with notes as an art form (or literary form) in and of themselves. The image of Duchamp with notes in his pocket (or wallet, as the case may be) also resonates with the reputation of Blaise Pascal (1623–32), French author, mathematician, physicist, philosopher, and theologian. Nineteenth- and early twentieth-century sources commonly referred to the original state of Pascal’s aphorisms as written on scraps of paper (*brouillons immortels*). His posthumously published *Pensées* (Thoughts) were gathered from such fragmentary writings on scraps of paper; Blaise Pascal, *Pensées de M. Pascal sur la religion, et sur quelques autres sujets, qui ont été trouvées après sa mort parmi ses papiers* (Paris: Guillaume Desprez, 1669). Recent examinations of Pascal’s fragments sometimes emphasize the deliberateness with which he prepared these *brouillons*, an approach akin to Duchamp’s dedication to the tactility and physical nature of his notes.

11. The words as engraved in French on the grave marker in the Rouen cemetery read “D’ailleurs c’est toujours les autres qui meurent” (Anyway, it’s always the others who die).

12. I have included this material because of the paucity of scholarship on Ferrero. Working with materials in the Rockefeller Archive Center, Regna Darnell has discussed correspondence regarding Ferrero’s fellowship application, noting Sapir’s interest in supporting the “literary man” to the extent of supporting his postseminar fieldwork by mail. Ferrero planned to study symbolism, presumably among Native Americans in New Mexico. Regna Darnell, *Edward Sapir: Linguist, Anthropologist, Humanist* (Berkeley: University of California Press, 1990), 342.

13. Paul Valéry, *Leonardo, Poe, Mallarmé*, trans. Malcolm Cowley and James R. Lawler, ed. Jackson Mathews (Princeton, NJ: Princeton University Press, 1972), 157.

14. The phrase appears in a note on page 438 in Morris H. Philipson, *Leonardo da Vinci: Aspects of the Renaissance Genius* (New York: Braziller, 1966). Philipson’s volume included an essay by Roger Shattuck, inspired in part by Valéry’s writings on Leonardo. At the time, Shattuck was a professor of French literature at the University of Texas, the foremost popularizer of Jarry in the United States, and a fellow member (with Duchamp) of the Collège de Pataphysique. At New York’s Museum of Modern Art, Shattuck spoke on a panel with Duchamp in conjunction with the “Art of Assemblage” exhibition. Transcripts of Shattuck’s introductory contribution and the symposium discussion appear in John Elderfield, ed., *Essays on Assemblage*, Studies

in *Modern Art 2* (New York: Museum of Modern Art, 1992). Duchamp's contribution to the symposium, titled "Apropos of Readymades," appeared in this transcript and elsewhere, including Marcel Duchamp, *The Essential Writings of Marcel Duchamp: Salt Seller = Marchand du Sel* (London: Thames and Hudson, 1975).

15. *Véritable portrait de Monsieur Ubu*, a woodcut, first appeared as the frontispiece to Alfred Jarry, *Ubu Roi: Drame en cinq actes en prose, restitué en son intégrité tel qu'il a été représenté par les marionnettes du Théâtre des Phynances en 1888* (Paris: Mercure de France, 1896).

16. Marcel Mariën (1920–93) was associated with the Surrealists in Belgium and, later, with the Situationist International. An editor, author, and poet, Mariën worked in collage and filmmaking. Marcel Mariën, "Psychological Aspects of the Fourth Dimension," *View* 7, no. 2 (1946): 7–10.

17. *Ibid.*, 9 (emphasis in the original).

18. *Ibid.* Paul Valéry, *Variété III* (Paris: Gallimard, 1936); Paul Valéry, *Mauvaises pensées et autres* (Paris: Gallimard, 1943 [1941]).

19. As discussed above, Duchamp and Man Ray's collaborative photograph of *Dust Breeding (Elevage de poussière)* was published in *Littérature*. *Littérature* appeared from 1922 to 1924. For an overview of the journal, emphasizing its use of visual art, see Christiand Briend and Clément Chéroux, eds., *Man Ray, Picabia, et la revue Littérature* (Paris: Editions du Centre Pompidou, 2014).

20. Mallarmé's poem is notoriously resistant to translation. This English version was created in a collaborative online project: translated by Joseph Kugelmass, revised by Rich Puchalsky, and edited by Adam Roberts. I thank Kugelmass, Puchalsky, and Roberts for their permission to reprint this translation. See "Translating Mallarmé," *Valve*, May 25, 2007, <http://www.thevalve.org/>.

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