Una sensibilità scientifica: Giacomo Balla’s Painting of Light, 1900-1914

Luise Mahler

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Una sensibilità scientifica: Giacomo Balla’s Painting of Light, 1900-1914

by

Luise Mahler

Submitted in partial fulfillment of the requirements for the degree of Master of Arts in Art History, Hunter College The City University of New York

2017

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ACKNOWLEDGEMENTS

This thesis developed out of a research methods seminar focused on Futurist drawings in the collection of the Museum of Modern Art, New York, led by Emily Braun at Hunter College, CUNY in the fall of 2008. My gratitude goes first and foremost to her for her unwavering guidance and support as my advisor and mentor throughout my graduate studies and beyond. Challenging, erudite, and encouraging, she has always allowed me ample space to develop my own thinking. This project would not have seen the light without her exceptional teaching, careful reading, and patient listening. My sincerest thanks are also due to Maria Antonella Pelizzari, whose expert knowledge and thoughtful responses as a reader have made this a stronger thesis. I am equally grateful for her generosity as my teacher at Hunter College from beginning to end. I extend my gratitude to Estrellita Brodsky and the college’s Mother’s Day Scholarship Fund for granting me invaluable support over the course of my graduate studies, to Philip Rylands, former director of the Peggy Guggenheim Collection in Venice, and his team for hosting me as a museum intern in the summer of 2010, to Laura Mattioli Rossi for enabling me to examine Giacomo Balla’s elaborate *Mercurio transita davanti al sole* (*Mercury Passing Before the Sun*) with the help of X-ray photography, and to Katy Siegel and William C. Agee, who have been a source of inspiration and encouragement. Most of all, I want to thank my husband Taoufiq and our daughter Emma Umayma; their loving support is beyond words.
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INTRODUCTION

Here in Italy everyone knows that my work is that of a precursor.

—Giacomo Balla in a letter to Alfred H. Barr, Jr., April 1954

Today, we are no longer interested in dynamism and simultaneity but we are struck by the fact that nobody, not even Kandinsky, nor Mondrian, nor Delaunay, was able to foresee, in such a perceptive manner [as Balla’s], the direction that painting would have taken more than forty years later.

—Arte Concreta (No. 2) published by the Movimento arte concreta (M.A.C.) in homage to Balla, December 1951

Giacomo Balla (1871-1958) painted Mercurio transita davanti al sole (henceforth Mercury Passing Before the Sun)—one of two elaborate tempera paintings in an extensive series that takes as its subject a rare astronomical event—toward the end of 1914 (fig. 1). Constructed out of purely geometric forms, primarily intersecting circles, orbs, and triangles, Balla’s rendition of the planet’s transit across the solar disk was the culmination of his interest in the physics of light and in optical devices that enhance human vision. Indeed, the diagonal and vertical lines crossing this dense composition of shapes have long been thought to suggest the movement of an observer who is simultaneously studying the celestial passage through a telescope and looking at it with

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3 In the following and throughout this thesis, I will use the abbreviated title Mercury to refer to the series in total and individual titles to refer to single works in the series. Also, whenever possible, the first mention of a historic individual in this thesis includes their life and death dates. In some cases, however, this information was not available.
the naked eye. Yet for the most part, the depth of Balla’s knowledge of astronomical phenomena demonstrated in *Mercury Passing Before the Sun* has been sidelined by the modernist interest in what is seemingly a precocious example of geometric abstraction in the years before World War I. The specificities of the *Mercury* motif, in particular the distinct patterns of white and blue triangles representing light as it refracts and moves through matter, owe to the artist’s early recourse to science. Printed images that circulated around the turn of the century for the purpose of public instruction, reporting, and scientific research aided Balla to introduce a new formal language in his art, one primarily based on geometric forms. This thesis argues that art and science are intimately linked in Balla: this painter’s geometric abstraction was deeply rooted in the study of light phenomena, the technologies used to record what normal vision could not grasp, and the images found in popular scientific magazines that represented the newest discoveries in both these areas.

Coming of age as a painter in the 1890s, Balla, who was firmly grounded in the positivist culture of his native northern Italy, intuited that the research produced by science contained an array of optical instruments—cameras, telescopes, and binoculars—that would assist the unaided human eye and thus advance art. He approached his compositions with methods borrowed from science, starting out by drawing naturalistic studies of objects that he encountered in the streets.

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of Rome—street lights and star constellations among them—and continuing to employ scientific apparatuses to further his pictorial ideas. Moreover, contemporary science and technology provided him with an iconography that served as visual model for his paintings. Eventually, this combined practice of personal observation and the study of pre-existing pictures borrowed from science allowed Balla to arrive at radically reductive but conceptually complex representations of light and movement.

Early in his career, the painter’s work was associated with Italian Divisionism, a variant of its French counterpart, Pointillism. Both movements questioned how natural vision works, and their respective members were each influenced by theories of color and perception. Balla’s reputation as a painter keenly interested in science and technology, however, has been most closely identified with the Futurist movement founded in 1909 by Filippo Tommaso Marinetti (1876-1944) and known for its idolization of speed and the machine. The notion of seeing Balla’s deep-seated belief in scientific progress as a source for cultural renewal through the lens of Italian Futurism is, in some form or another, the most common framework used in accounts of his work. In fact, Balla played a significant role in advancing his artistic legacy through this particular narrative in the 1950s and before his death in 1958. During this decade, younger Italian artists—above all from the Movimento arte concreta (M.A.C.)—as well as an international group of art historians, collectors, and curators such as Alfred H. Barr, Jr. (1902-1981), who was then Director of Collections at The Museum of Modern Art in New York, reassessed his work and contributions to twentieth-century art. In an oft-quoted letter sent to Barr

5 The Centre Georges Pompidou, Musée national d'Art Moderne, Centre de Création Industrielle, in Paris was the first museum to acquire one of the Mercury paintings for its permanent collection in 1951. This purchase for a public institution was followed by the acquisition of Balla’s iconic painting Lampada ad arco (henceforth Street Light) by Alfred H. Barr, Jr. for the Museum of Modern Art (henceforth MoMA) in New York three years later. At this time, MoMA already owned two other seminal paintings by Balla, namely Automobile in corsa – velocità + luci (henceforth Speeding Automobile Automobile – Velocity + Light) and Linee andamentali + successioni dinamiche – Volo di Rondini (henceforth Swifts: Paths of Movement + Dynamic Sequences). Laurance P. Roberts, then Director
in April 1954, Balla asserted that, “here in Italy everyone knows that my work is that of a precursor.”

What has complicated a more nuanced reading of Balla’s role as a precursor in the development of abstraction is, on the one hand, the close relationship that he himself maintained between his abstract work and Futurism, and, on the other, the predominant notion that he, above all, was a Futurist painter. However, such narrow focus on Futurism has hindered most scholars (M.A.C. and Barr are some of the exceptions) to fully discern the prescience of his artistic project and to acknowledge his position as one of the vanguards of twentieth-century abstract painting. Taking its cue from M.A.C., a more productive way of understanding Balla’s abstraction would be to view it as belonging to another, less explored track of Futurism. An overview of the literature and primary sources not only shows the dominance of studies that examine Balla’s work in the context of Futurism but also highlights the uniqueness of the 1954 letter, as the painter rarely wrote on the subject of his art. In an effort to counter this trend, the approach taken here recognizes, on the one hand, how early Balla engaged in a dialogue between art, science, and technology as a catalyst for innovative ideas and, on the other, how effortlessly Balla’s most radical formal solutions migrated across the boundaries of avant-garde movements and periodization.

In the 1950s, Balla’s work received renewed interest from a new generation of artists and curators who organized monographic exhibitions in New York, Paris, and Rome, among other cities. Retrospectives highlighting his entire oeuvre, however, were not held until after his death of the American Academy in Rome, had acquired them for the museum in May 1948. For the works cited above, see Giovanni Lista, Balla (Modena: Galleria Fonte d'Abisso, 1982), nos. 200, 307, and 357, and Giacomo Balla: Futuriste, (Lausanne: Éditions L’Âge d’Homme, 1984), no. 1090.

For Balla’s letter, see footnote 1 in this section.

The following list of exhibitions is not exhaustive and instead intends to give only a broad overview of the shows organized in Balla’s honor during this period. In 1951, the Galleria Borromini in Milan and the Fondazione Origine in Rome each organized a one-man exhibition of Balla’s work. A year later, a show presented by the painter’s
in March 1958; the first of them took place in his native city of Turin in 1963 and another one, celebrating his centennial, was in Rome in 1971.\(^8\) The catalogues accompanying these exhibitions are still considered standard references for any scholar of Balla’s work.\(^9\) Since then several other exhibitions and publications with a focus on Balla and the artistic circle surrounding him in Rome have been mounted and published. Among these, the most relevant in the context of this thesis are Enrico Crispolti’s 1989 publication *Casa Balla e il futurismo a Roma*, the 2008 anniversary retrospective *Balla: La modernità futurista*, organized at the Palazzo Reale in Milan and spearheaded by Giovanni Lista, Paolo Baldacci, and Livia Velani, as well as the important 2014 exhibition *Italian Futurism 1909-1944. Reconstructing the Universe* organized by Vivien Greene at the Solomon R. Guggenheim Museum in New York and the 2015 gallery show *Painting in Italy, 1910s-1950s: Futurism, Abstraction, Concrete Art* at Sperone Westwater in New York.\(^10\) Each of these exhibitions added to the understanding of Balla’s place in the history of twentieth-century art, while also publishing individual works related to this study that would not have been known otherwise. Another albeit smaller exhibition is the 1997 *Casa Balla: Un pittore e le sue figlie tra futurismo e natura*, which produced a noteworthy

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\(^9\) Of particular note here is Livia Velani’s excellently researched “Regestri biografici e bibliografici,” which among other features contains complete lists of works (recorded whenever possible by date, title, and number) included in the various exhibitions that Balla participated in until his death in 1958. See Livia Velani, “Regestri biografici e bibliografici,” in *Giacomo Balla (1871-1958)* 1972, 23-140.

publication: a preliminary, unfinished catalogue raisonné of those works Balla devoted to the theme of celestial light and astronomy. This project was prepared by Maurizio Fagiolo dell’Arco in collaboration with Elena Gigli. In the United States, Balla’s work has been presented in one-man exhibitions held at numerous galleries as well as in group exhibitions devoted primarily to Italian Futurism and the advent of abstract art. In contrast to the ongoing scholarly efforts in promoting Balla’s artistic legacy in Europe, however, his art, interestingly, has never been the subject of a retrospective organized by a North American museum. Indeed, such an undertaking would be a welcomed opportunity for artists, critics, and art historians to examine his oeuvre in relation to the development of abstract, concrete, and kinetic art.

In addition to the catalogues that accompanied these exhibitions, a number of publications informed broader audiences about Balla after his death in the late 1950s. Following the efforts of Crispolti and Maria Drudi Gambillo, who were the first to relate the Mercury series to the planet’s actual transit on November 7, 1914, Maurizio Fagiolo dell’Arco published a multi-volume book series on Balla’s work and writings between 1967 and 1970. These attempts in charting the painter’s oeuvre were complemented in 1969 by an album of the painter’s life and work in photographs prepared by Virginia Dortch Dorazio, which included


13 Most recently, the Estorick Collection in London organized the exhibition Giacomo Balla: Designing the Future, which was curated by Fabio Benzi and opened on April 5, 2017. In Italy, Balla’s work devoted to the subject of light was featured last at the Galleria Nazionale d’Arte Moderna e Contemporanea in Rome. Titled Giacomo Balla: A Wave of Light, this exhibition was put together by Stefania Frezzotti.

14 For a publication that includes all of the individual volumes in this book series, see Maurizio Fagiolo dell’Arco, FuturBalla (Rome: Mario Bulzoni, 1970).
among other images those of his tools and his telescope. Finally, in 1982 Giovanni Lista published the first of two volumes of an extensive catalogue raisonné that included not only Balla’s paintings but also his works on paper and three-dimensional objects. The second volume was released in 1984. Over time, however, works that were not included in either of these references have emerged as part of public sales or exhibitions.

Each of these publications contributed to the understanding of Balla’s interest in science and technology, but his reliance on scientific methods and tools was mostly mentioned in passing until Marta Braun’s excellent 1992 study of the work of Étienne-Jules Marey established when Balla and other European avant-garde artists first encountered Marey’s chronophotography. Her initial research on the influence of scientific photomechanical imaging on Balla was preceded by studies by Lista, who focused more generally on photography and Futurism, as well as Susan Barnes Robinson’s dissertation on the painter’s development from Divisionism to Futurism until 1912, in which she relates a number of the painter’s works to specific photographic sources. Last but not least, Linda Dalrymple Henderson’s 1983 study of the fourth dimension and the influence of non-Euclidean geometry on modern art should be

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mentioned as another significant early contribution to the study of science and the development of twentieth-century painting.\(^{20}\)

Yet, despite the many textual and visual references made to science and technology in these publications, studies that investigate specific sources in relation to Balla’s pictorial representations of light and movement were not published until recently. Foremost among these considerations are Flavio Fergonzi’s 2003 catalogue raisonné of the Gianni Mattioli Collection as well as Christine Poggi’s 2009 examination of Balla’s *Compenetrazioni iridescenti* (henceforth *Iridescent Interpenetrations*) series (fig. 3).\(^{21}\) Although these and other scholars have scrutinized gaps in the understanding of Balla’s quasi-scientific artistic practice as well as presented a more nuanced view of his contributions to Futurism, the full extent of the painter’s reliance on science and technology has not been examined until now. A consideration of the socio-cultural implications of the popularization of these fields of knowledge in Italy during the late nineteenth- and early twentieth-century has only recently become available through a expanding body of research presented by historians of science as well as cultural historians.

Focused on the print media in post-unification Italy and the gradually growing consumption of science that followed in its wake, but also more generally on the dissemination of the most recent news and findings by way of the popular press across Europe, these contributions assist art

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\(^{21}\) Flavio Fergonzi, *The Mattioli Collection, Masterpieces of the Italian Avant-garde: Catalogue Raisonné* (Milan: Skira, 2003), and Christine Poggi, “Photogenic Abstraction: Giacomo Balla’s *Iridescent Interpenetrations*,” in *Inventing Futurism: The Art and Politics of Artificial Optimism* (Princeton and Oxford: Princeton University Press, 2009), 109-49. The *Compenetrazioni iridescenti* (henceforth *Iridescent Interpenetrations*) series, began in 1912, is considered one of the largest groups of paintings Balla produced during his lifetime. However, not every work in this series appears to date to the pre-World War I period. A comparison of pictures that emerged on the art market in the 1950s, when Balla’s work had gained renewed interest from curators and collectors, with those paintings that can be reliably dated to between 1912 and 1914 demonstrate differences in style and facture. In turn, these stylistic discrepancies have generated questions about the dating of the works as well as the identity of their maker. Based on her research and first-hand examinations, Poggi suggests that the *Iridescent Interpenetrations* in the collection of the Galleria Civica d'Arte Moderna e Contemporanea in Turin are works produced by Balla before World War I.
historians in assessing the interconnection between science, education, and cultural renewal during this period. Moreover, their findings help to pinpoint the occasions at which avant-garde artists encountered scientific and technological advances of the late nineteenth and twentieth centuries. Most notable among them are scholars Charlotte Bigg, Jimena Canales, John Davis, and Paola Govoni. It is in large part thanks to these interdisciplinary studies and examinations that this analysis of key works by Balla depicting light and movement between 1900 and 1914 can be attempted.

Much of what is known about Balla’s artistic vision in representing light and movement before World War I derives from letters and postcards sent to his family and friends, as the painter himself wrote relatively little. In many instances, these letters included pencil or watercolor sketches, a form of visual note-taking while travelling but also an explication of his pictorial ideas and research for future works. In fact, many of these sketches are directly related to a number of paintings Balla produced up until 1914 and thus, have often served as a point of reference for formal analysis and historical interpretations. Read jointly, these letters and sketches reveal the painter’s response to new sensations such as the reflection of natural light or the artificial splendor generated by electric light. In addition to these letters, Balla’s younger


23 A great number of these letters are excerpted in Fagiolo dell’Arco 1970. Other references that include Balla’s writings and are relevant to the period under examination here are Ricostruzione di casa Balla, edited by Paolo Baldacchi (Milan: Arnoldo Mondadori Editore, 1986), and Giacomo Balla, Scritti futuristi, compiled and edited by Giovanni Lista (Milan: Abscondita, 2010).
daughter, Elica (1914-1993) published a three-volume memoir of her father, which includes many anecdotes and biographical detail between 1984 and 1986.\textsuperscript{24} Her recollections are based on what Balla and other family members, including her older sister Luce (1904-1994), shared with her. In addition, Elica Balla drew on Balla's correspondence, rare writings, as well as publications and interviews with him. Her recollections are invaluable to any study of the painter’s work but they are also vulnerable to the charge that they are founded on primarily second-hand memory, especially with regards to the period before World War I.

In exploring the influence of contemporary science and technology on Balla, it is also instructive to draw on reviews of the painter’s work and interviews that predate the end of the Great War.\textsuperscript{25} Less interested in proselytizing than his student and fellow Futurist Umberto Boccioni (1882-1916), Balla was just as innovative and arguably more influential. Such reviews and interviews attest to the painter’s predilection for nocturnal views as particularly suitable for the study of light in two dimensions.\textsuperscript{26} Using these rare primary sources, I trace the painter’s efforts in creating a novel modernist pictorial language to render the visual experience of light.

Balla’s personal statements and the pre-1918 exhibition reviews commenting on his works invoke the influence of contemporary science and technology only indirectly. This is particularly problematic in light of the direct references made to contemporary science and technology in the Futurist manifestoes and in the writings by Marinetti and other members of the

\textsuperscript{24} Elica Balla, \textit{Con Balla}, vols. 1-3 (Milan: Multhipla Edizioni, 1984-86).

\textsuperscript{25} The most comprehensive publications including these references are the two-volume \textit{Archivi del Futurismo} and the similarly lengthy \textit{Archivi del Divisionismo}. See \textit{Archivi del Futurismo} 1958-62 and \textit{Archivi del Divisionismo} 1969.

\textsuperscript{26} See, for example, Settimio Aurelio Nappi’s review entitled “Visitando l’Esposizione di Belle Arti: Giacomo il Notturno.” Cited in Barnes Robinson 1981, 61. Reminiscing in 1908 about a visit to Balla’s studio, the writer Ugo Antonielli also recognized the emotive intensity of Balla’s renditions of light as well as his efforts in capturing both light and shadow.
movement. It is worth remarking that none of the manifestoes published prior to 1914 mention, for example, the use of actual instruments that enhance human vision such as binoculars or telescopes.\textsuperscript{27} Due in part to the lack of theoretical writings by the painter and the few oblique references to science and technology in his correspondence and interviews, scholars tend to view the influence of these fields of knowledge through the narrative of the incendiary catchphrases published by the Futurists. Yet Balla did not participate in the writing of the earliest, founding Futurist manifestoes and thus, these writings should not be seen as indicative of his views. Rather his joining the movement in 1910 was tantamount to furthering his art.\textsuperscript{28} When Balla adhered to Futurism, he was already a well-established painter with a prolific body of work guided by his Divisionist method and well aware of the stimulus that science and technology had to offer art.

The chief argument I make by looking at the broader context of science and technology in \textit{fin-de-siècle} Italy vis-à-vis Balla’s interest in these subjects is three-fold. First, I maintain that the painter’s abiding efforts to visualize light and movement in painting, and his development toward abstraction, reflect a mode of experiencing modernity unique to late nineteenth- and early twentieth-century European positivist culture, one deeply informed by popular scientific writings. Second, I demonstrate that few avant-garde painters who, like Balla, pioneered a path toward abstraction, made such productive use of optical devices that assist the human eye in seeing the invisible, in an effort to renew art. In fact, Balla was the only modernist European artist, let alone Futurist artist, to do so. Third, Balla preceded his Futurist peers in assessing the

\textsuperscript{27} For the various manifestoes, see \textit{Futurism: An Anthology}, edited by Lawrence Rainey, Christine Poggi, and Laura Wittman (New Haven and London: Yale University Press, 2009).

changes that modernity wrought upon perception by continuously absorbing information about scientific and technological innovations. Indeed, the other Futurists recognized the prescience of the older painters’ subject matter, investigation of luminous energy, and novel representation of the movement of visible light particles.

This study culminates in a discussion of the Mercury series and it departs from his early painting La Fiera di Parigi (Luna Park) (henceforth Paris Fair) (fig. 4) to show Balla’s longstanding dedication to the representation of optical phenomena. In doing so, I revise the prevalent notion that his enthusiasm for science and technology was prompted by Futurism and counter the usual divide between his Divisionist and Futurist periods marked by the iconic late 1911 painting Street Light, also a key subject of analysis in this thesis. Such revision appears particularly pertinent since artists working in Italy in the 1950s already recognized Balla’s contribution to twentieth-century abstraction as relating to a much larger artistic project and as exceeding the findings of Futurism; one that, in retrospect, pursued abstraction as another notion of the movement.

The chronological boundaries of 1900 to 1914 that bracket this thesis are based on the fact that Balla was scientifically informed and experimental in picturing light and movement from around the turn of the twentieth century through mid-1915. Although both themes remained important subjects for the painter, during World War I he turned to nationalist and interventionist inspired subjects. He also developed a new style of flat colored planes akin to contemporary Synthetic Cubism, while turning his attention to landscape rather than planets and stars. His manifesto, “Futurist Reconstruction of the Universe” (1915), co-authored with Fortunato Depero (1892-1960) marked not only a new departure for Balla toward other media besides painting, but also for the Futurist movement on the whole. By 1918, his abstract art was additionally and
deeply influenced by Theosophy, and no longer solely empirically and scientifically based as before the Great War.

With the aim of tracing the profound effects of science and technology on Balla’s artistic practice and subject matter, this thesis commences with an examination of the broader context in which these fields of knowledge were popularized in fin-de-siècle Italy. My first chapter focuses on the painter’s encounter with scientific and technological advances through a number of popular media. I describe the newly invented halftone process that aided the popularization of science and how this printing technique by photographic means resulted in an unprecedented amount of textual and visual information on the most diverse subjects readily available to common, albeit mostly urban, readers. In this chapter I also explain the relationship between Balla’s work and the new images and iconography produced by scientists. The link between the proliferation of scientific images in the popular press and the evolution of an abstract style in Balla’s painting has received relatively little attention. Through a comprehensive reading of newly discovered as well as previously published references I establish that such articles and illustrations provided a source for a significant number of his visual motifs as well as nurtured his abiding efforts to visualize light and movement.

The second chapter takes as its subject Balla’s step-by-step development in rendering artificial light, focusing on Paris Fair of 1900 and Street Light of late 1911 (backdated to 1909 on the canvas by the artist). Rather than classifying them as part of Balla’s Divisionist or Futurist periods, I view them as part of the painter’s larger project in capturing light on a canvas; in fact, the continuities between the two paintings–especially the infatuation with electricity–indicates that Balla may not have conceived of Street Light in quite the same fashion if it had not been for the way he had experienced Paris, the ville lumière or the City of Light, in 1900. I argue that the
painter himself made no strict distinction between his Divisionist and Futurist paintings after he began to show with the Futurists, which occurred only in 1913, well after he affixed his name to their 1910 manifesto. Indeed, before World War I, any painting devoted to the theme of light in his oeuvre is best and most fully understood in relation to his own independent interests, rather than as a response to Futurism, especially when such suppositions are based on a work’s post-1910 date. The chapter concludes with a brief discussion of Balla’s next, major series, the *Iridescent Interpenetrations*, by way of which Balla turned to scrutinizing the depiction of natural light in fully articulated pictorially abstract terms.

The third chapter is devoted to an intense period of experimentation after Balla had turned from an exploration of the specificities of artificial light to those of natural light. Following the first *Iridescent Interpenetrations* watercolors of 1912 (see, for example, figs. 3 and 39), in which he had achieved a distillation and chromatic synthesis of visible light through a purely geometric expression, Balla committed himself to the study of astronomical events, chief among them the *Orbite celesti* (henceforth *Celestial Orbits*; 1913) (fig. 5) and the *Mercury* series (1914). I situate these works within the broader context of the painter’s interest in rendering specific light effects, his ongoing fascination with painting luminous energy, and his continuous reliance on science as a source material. Whereas his paintings of artificial light demonstrated Balla’s interest in how electricity had changed the experience of nighttime, the visual experience represented in these paintings of occurrences in the Earth’s atmosphere and in space is different: active rather than passive, and one in which the observer is asked to imagine the experience of the scientist looking closely in order to collect data. In these works Balla emphasized the act of seeing by inserting a visual representation of the actual technological apparatuses that aid human vision. Driven perhaps by the need to reinstate the viewer, but no less inspired by the images and
iconography provided by science, Balla explored through the form and content of the *Celestial Orbits* and *Mercury* pictures a novel artistic mode of perceiving and picturing light.

The innovative quality of Balla’s artistic representation of light lies, on the one hand, in the creation of what are ostensibly empirical records of the visual experience of luminous energy; and, on the other, in the ways in which he exploited the potential of vision-enhancing instruments for the uses of art. The telescope in particular enabled the painter to avoid the romantic shortcomings he recognized in the paintings of his predecessors and contemporaries because it offered him new ways of conceiving distinct aspects of light phenomena: day and night, across time and space, and under different atmospheric conditions. As he wrote to Boccioni in the spring of 1914, “putting full pressure on objective material brings about the reaction of the *subjective Abstract.*”29 It was science and its complementary tools that assisted Balla in “putting full pressure” on seeing light in painting and rendering its true expression before, during, and after he joined the Futurist movement.

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CHAPTER 1

SCIENZA PER TUTTI:
POPULARIZING SCIENCE IN LATE NINETEENTH- AND EARLY TWENTIETH-CENTURY ITALY

[...] now, photography encompasses all branches of human knowledge.

—Introduction to *Musée rétrospectif de la classe 12. Photographie: (Matériel, procédés et produits) à l’Exposition universelle internationale de 1900*

In the realm of inspiration, [the poet’s] liberty can not (*sic*) be less than that of a daily newspaper which on a single sheet treats the most diverse matters and ranges over the most distant countries.

—Guillaume Apollinaire, 1918

Born in Turin in 1871, Giacomo Balla grew up immersed in a culture of science, technology, and modernization. As one of the intellectual hotbeds of modern Italy, Balla’s native city was long considered a vital center of scientific thought and exchange. The Piedmontese capital was guaranteed access to pioneering ideas generated by various European and international experts not least because of its geographic proximity to France and Switzerland. Meanwhile, the industrial prowess of northern Italy had largely contributed to the modernization efforts launched by the unification and founding of the new nation-state in 1870. Coming of age as a painter in the 1890s, Balla intuited that the research produced by scientists harbored a plethora of new subject matter and tools that could aid the human eye and thus advance the arts. Yet Balla’s interest in scientific and technological subject matter has been examined largely through the lens

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of Italian Futurism and twentieth-century modernism. This chapter proposes more concerted research on the period from Balla’s birth up to his adherence to the Futurist movement in 1910, positioning the painter as an artist grounded firmly in the nineteenth century who encountered modernity through a number of public and popular media such as illustrated periodicals, printed ephemera and exhibitions as well as personal connections with scientists. In fact, a visit to the 1900 Exposition Universelle in Paris affirmed for Balla not only that contemporary science and technology provided new images and iconography but also that addressing his compositions with methods borrowed from science would allow him to arrive at a radically new representation of light and movement. A life-long science enthusiast and amateur astronomer, Balla fashioned himself in the decade following his 1900 visit to Paris as an artist-turned-experimental-scientist, who tested and re-tested ideas and figurative solutions until he saw a truth beginning to emerge.

Looking at the broader context of science and technology in fin-de-siècle Italy, I argue that Balla’s unwavering determination to visualize light and movement in painting, and his subsequent exploration of abstraction, reveal an attitude specific to the period's prevalent positivism, one that believed insights and methods derived from these fields of knowledge would further advance all areas of life, including art. I will make this point first by examining the milieu in which Balla became exposed to science and technology before 1910. In a second step, I will show how Balla’s interest in photography coincided with the advanced role this new image-making technology played in disseminating current scientific findings in Italy and abroad during this period. Here, his friendship with the local astronomer Armando de Paolis (?-1946), who, hitherto, is noted in the literature only by his last name helps to further demonstrate the close relationship between Balla’s artistic practice and the way in which discoveries and innovations

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3 Whenever possible, the first mention of a historic individual in this thesis includes their life and death dates. In some cases, however, this information was not available.
were promulgated in popular culture.\textsuperscript{4} These various avenues of encounter indicate that the repertoire of visual experiences available to the painter through popular media, entertainment, and individual relationships was vast and likely expanded over time.

Following Italy’s unification in 1870, two schools of philosophy controlled the academic and regional landscape of the new nation-state. While idealism, influenced by the teachings of Immanuel Kant (1724-1804) and Georg Wilhelm Friedrich Hegel (1770-1831) but also Giambattista Vico (1668-1744), had significant strongholds in central and southern Italy, the positivist school was most prominent in the north.\textsuperscript{5} Confidence in the scientific method as the sole dependable form of knowledge production grew particularly strong amongst northern positivists.\textsuperscript{6} To them, science and technology provided the means to reform social conditions such as hygiene, diet, and education across the Italian peninsula. Despite the prosperous industries of northern Italy, the recently centralized nation-state was still a largely agrarian society with high illiteracy rates and an uneven regional distribution of resources.\textsuperscript{7} The highest economic growth and greatest wealth were concentrated in Milan, Turin, and Genoa. Located geographically at the margins of Western Europe, Italy, at the turn of the twentieth century, was considered a backwater of modern European economy and industrialization. Moreover, the slow

\textsuperscript{4} See Giovanni Lista, \textit{Balla} (Modena: Galleria Fonte d'Abisso, 1982), 69, and Elica Balla, \textit{Con Balla}, vol. 1 (Milan: Mutilpla Edizioni, 1984), 137. Although his first name remains unmentioned in these references and his last name is spelled inconsistently, it appears highly likely that Balla’s astronomer friend was the Roman scientist Armando de Paolis, who was also known as Armand de Paolis and who died in 1946. De Paolis’ death on December 9, 1946, was announced in \textit{Memorie della Società Astronomia Italiana}, vol. 18 (1946), 158.

\textsuperscript{5} The criminal anthropologist Cesare Lombroso (1835-1909) best embodies the positivist spirit then present in Turin, the painter’s native city. For further reading on Lombroso, see Mary Gibson, \textit{Born to Crime: Cesare Lombroso and the Origins of Biological Criminology} (Westport, Connecticut: Praeger, 2002).


industrial development and traditionalism of the central and southern regions threatened to impede the formation of a new and dynamic nation.

Popular writings on science, technology, and modern civilization played a principal role in shaping post-unification Italian culture and reform efforts. One of the social reforms aimed at reversing the nation’s relative backwardness was the so-called “scienza per tutti” (henceforth “science for all”) movement that peaked in the 1870s and 1880s. As historian of science Paola Govoni describes: “It was in the wake of the political enthusiasm generated by unification that many Italian scientists engaged in popular science, and the educated middle classes, encouraged by publishers acquainted with international publishing markets, were the protagonists of the success—mainly in the north of the country—of popular science literature.”

The principal ideas behind the “science for all” movement—to spread education and disseminate contemporary scientific and technological knowledge—profited from the influx of culture “imported from outside” Italy since 1880. Moving beyond traditional academic circles, the growing publishing industry in northern Italy “encouraged the circulation of excellent-quality works [in science and technology] among both experts and the non-specialized educated public.”

Inspired by foreign models, a new generation of scientists, publishers, and editors fashioned an Italian version of popular science. In 1884, publishing magnate Emilio Treves (1834-1916), for example, introduced the Italian public to a weekly magazine titled La Natura,

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9 David Forgacs argues that the cultural consumption of foreign intellectual ideas and products was particular to Italy during the post-unification period. David Forgacs, Italian Culture in the Industrial Era 1880-1980: Cultural Industries, Politics and the Public (Manchester and New York: Manchester University Press, 1990), 5.

10 Govoni 2009, 27.
which was modeled after the British periodical *Nature* and its French counterpart *La Nature*.\(^{11}\) Founded by astrophysicist and science communicator Joseph Norman Lockyer (1836-1920), *Nature* reported on a wide variety of contemporary scientific topics that appealed to a broad audience comprised of scientists as well as the educated urban public.\(^{12}\) Although the Italian version of *Nature* never matched the success of its foreign counterparts and ultimately ceased publication after only two years, its existence during this time exemplifies the ambitions associated with the popularization of science in post-unification Italy.\(^{13}\)

This trend also dovetailed with a growing national market for illustrated periodicals, books, pamphlets, and almanacs.\(^{14}\) Improved printing and distribution processes and cheaper paper resulted in an abundance of inexpensive publications and a wider readership. Although the supply of most Italian newspapers and illustrated periodicals was restricted to local and regional markets, the print media emerged as a vital instrument during the building of the new nation-state by reporting on current political, scientific, commercial, and cultural developments.\(^{15}\) Yet,
in part because they were published in an Italian that had only recently been nationalized and to the country’s high illiteracy rate, especially amongst women, readership was limited to an educated and affluent public. Children born after 1870 and living in urban centers proved to be an exception to this rule since “literacy increased more rapidly” in cities during the last decades of the nineteenth century.\textsuperscript{16} Among the many examples of newly founded illustrated newspapers and periodicals, the journal \textit{Emporium} (Bergamo, 1895-1964) and the magazine \textit{L’Illustrazione Italiana} (Milan, 1875-1962) stand out for their reporting on contemporary politics, science, and culture.\textsuperscript{17}

One of the principal Italian \textit{fin-de-siècle} cultural journals, \textit{Emporium} was an illustrated monthly committed to publicizing the arts, literature, and entertainment as well as science and commerce.\textsuperscript{18} Established by critic and founder of the Venice Biennale Vittorio Pica (1864-1930) during the last decade of the nineteenth century, \textit{Emporium} covered a variety of subjects ranging from exhibition reviews to columns on current trends in science and articles on aspects of modern life. Similarly to \textit{La Natura}, \textit{Emporium} had a foreign precedent: the contemporary English journal \textit{The Studio} (London, 1893-1964, then \textit{Studio International}).\textsuperscript{19} \textit{L’Illustrazione Italiana} was a weekly, illustrated magazine dedicated to daily events related to culture, science, and social issues as well as figures of public interest. Founded by Treves in 1873 under the title

\begin{itemize}
\item \textsuperscript{16} For literacy and illiteracy rates and the distribution of the reading public in Italy from 1861 to 1951, see Forgacs 1990, esp. 17-19.
\item \textsuperscript{17} \textit{L’Illustrazione Italiana} was published weekly between 1875 and 1950. The lavishly illustrated semi-monthly journal \textit{Natura ed Arte: Rassegna quindicinale illustrata italiana e straniera di scienze, lettere ed arti}, published by Francesco Vallardi in Rome and Milan between 1891 and 1911 and superseded by \textit{La Cultura Moderna}, could not be considered as part of this thesis due to a lack of access. A future consultation of \textit{Natura ed Arte}, which frequently published Balla’s work as part of reviews and other articles, would show how its content might also be relevant to the painter’s artistic practice.
\item \textsuperscript{18} The Italian critic Vittorio Pica (1864–1930) edited the journal to which he also frequently contributed.
\end{itemize}
Nuova Illustrazione Universale and renamed L’Illustrazione Italiana two years later, the Milanese magazine placed a stronger emphasis than Emporium on regional and national events. Whereas these events were discussed in concise reports, large sections of the magazine were reserved for visual content consisting mostly of photographs, illustrations, reproductions of works of art, scientific renderings, as well as advertisements. In addition, the front cover of L’Illustrazione Italiana generally featured a full-page image reporting on current affairs (fig. 6).

Two related aspects of how information was conveyed in both of these illustrated periodicals are worth examining in the context of Giacomo Balla’s artistic practice. The first is the way in which both periodicals touched on all aspects of life around the turn of the twentieth century. Not unlike an encyclopedia, the pages of Emporium and L’Illustrazione Italiana grouped seemingly divergent content side-by-side. Under the umbrella rubric Esposizione, for example, both periodicals frequently published reviews of art exhibitions—among them annual shows that included Balla’s paintings such as the Esposizione di Belle Arti (Fine art exhibition) organized by the Società degli Amatori e Cultori and the Esposizione Romana di Belle Arti (Roman exhibition of fine arts)—while also promoting shows that presented the industrial arts as well as those dedicated to various branches of commerce such as electricity. A similarly varied mix could be found in the editorials, which in any one issue ranged from contemporary art reproductions to reports on the newest scientific technologies to current politics. In 1918, when other avant-garde artists—chief among them Georges Braque (1882-1963) and Pablo Picasso

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(1881-1973)—were already culling the pages of mass dailies, art critic Guillaume Apollinaire (1880-1918) acknowledged the creative potential of juxtaposing such diverse subjects in an essay titled “L’Ésprit nouveau et les poètes.” Apollinaire wrote: “In the realm of inspiration, [the poet’s] liberty can not (sic) be less than that of a daily newspaper which on a single sheet treats the most diverse matters and ranges over the most distant countries.”21 For Balla, the double-page spreads of illustrated periodicals and books not only provided prompt access to the most recent international advances in science and technology but also offered a wide variety of images illustrating these achievements that could serve as models for his artistic vision of light and movement. Moreover, science and its steady discoveries kept catapulting humanity to new, unforeseen heights and, in turn, promised to feed the creativity of artists such as Balla by enticing them to imagine the world that promised to lie beyond that which was already known.

The second aspect of how information was communicated on the pages of these two illustrated periodicals concerns the role played by photography and other visual sources. In the numerous rubrics and columns of Emporium and L’Illustrazione Italiana, new scientific and technological knowledge was communicated to the reader in equal measure through text and image. Recent technological innovations such as the telephone, underground transportation, or hydroelectricity, for example, were discussed as part of dedicated columns titled “I Grandi servizi pubblici moderni” and “Applicazioni scientifiche” in Emporium and “Scienza, industria e lavori pubblici” in L’Illustrazione Italiana. The largely black-and-white photographs and illustrations printed in halftone and published alongside the text of these columns were of particularly high quality both in terms of the detailed information they relayed and in terms of the innovative visual language of cropped, magnified, and angled compositions used to represent

21 Apollinaire 1971, 228-229.
the subject matter. These images captured the reader’s attention and succeeded more directly in illustrating how modern advancements in science and technology applied to everyday life, and what changes they implied. For example, a report on telephonic communication in New York City published in *Emporium* reproduced pictures of the newest wall set model—including a hand receiver, transmitter, and side crank—as well as a picture of Alexander Graham Bell (1847-1922) opening the long-distance telephone line with Chicago on October 18, 1892, to illustrate the experience of this new technology in user-friendly terms (fig. 7). Other images included in this report zoomed in on thick wires that had to run underground to electrically transmit the messages and on switchboards, which had been cropped to accentuate a “behind-the-scenes” view of telecommunication (fig. 8).

Moreover, photography and its application to science and art became itself the subject of a great number of commentaries published in both periodicals. Articles such as “Le Fotografie Telegrafate” and “Fotografia Artistica: Paesaggio,” which appeared in the first issues of *Emporium* in 1895, presented concrete examples of different kinds of images that had been accomplished using electronic, photographic, and telegraphic technologies. “Le Fotografie Telegrafate,” for example, included a half-tone reproduction of a man’s portrait, whose face and upper body appear partially disfigured as a result of numerous horizontal gray and white transmission lines running across the image thereby obscuring his appearance (fig. 9). The image was meant to illustrate state-of-the-art photo-telegraphy. To the eyes of an artist, however, the radically new aesthetic produced through this mechanized “seeing by electricity” must have been


invigorating in terms of new modes of visual representation. Though Balla likely leafed through the issues of Emporium and L'Illustrazione Italiana to read reviews of his work, his perusal did not end there. A significant number of his paintings indicate that the pages of these periodicals inspired him to formulate modern depictions of traditional subject matter ranging from light itself to star clusters to tools for viewing objects at a distance.

At the turn of the twentieth century, photography touched on all aspects of life, as the organizers of the French photography section at the 1900 Exposition Universelle among others acknowledged. During this period photographic images were used widely: as an optical device to promote nationalist projects, as a method to record, document, and popularize current scientific and technological findings, and as a technique to endorse cultural achievements in art, theater, and literature. What is more, having one’s photograph taken was a favorite pastime that enabled loved ones, families, or colleagues in distant places to share mementos amongst themselves. The surge in image production was in large part due to the invention of lithography—a modern printmaking technique invented in the eighteenth century that employed the smooth surface of limestone or grained metal to reproduce pictures mechanically—and of photography. Both methods of mechanical reproduction allowed editors, scientists, and writers among others to inexpensively print different kinds of illustrations and text.

As a result of the advances in printmaking and the development of mass communication, pictures published in the popular print media had as much impact on the evolution of style and creative practices as the art produced by Impressionist, Post-Impressionist, and Symbolist artists.

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24 The art or term “seeing by electricity” implies a sending of images along wires. A significant number of scientific articles published across Europe and the United States in the 1880s and 1890s used this expression to refer to the new technology of photo-telegraphy. This technology preceded and influenced early television. For a bibliographic overview of writings on the subject, see George Shiers with the assistance of May Shiers, Early Television: A Bibliographic Guide to 1940 (New York: Garland Publishing, Inc. 1997), esp. 12-23.

25 See footnote 1 in this section.
prior to the period under examination here. The images and explanatory commentary included in, for example, Alexander von Humboldt’s (1769-1859) Kosmos of 1845-62, Aaron Bernstein’s (1812-1884) Naturwissenschaftliche Volksbücher of 1855-56, Charles Darwin’s (1809-1882) The Origin of Species of 1859, and Camille Flammarion’s (1842-1925) Astronomie populaire, description générale du ciel of 1880 captivated the curious minds of the educated, new urban middle-class and especially young readers. Balla was likely one of those early readers of popular scientific literature, having been educated during the last decades of the nineteenth century when the popularization of science and technology peaked. Another reader of the genre was Albert Einstein (1879-1955), who admitted to having discovered science for himself “through the reading of popular scientific books” at an early age.

Judging by his later work, it is easy to imagine that Balla was as captivated as the young Einstein by the images and commentary that described and depicted contemporary scientific knowledge. Other scientists of this period, including Joseph Norman Lockyer, who had founded the British periodical Nature, and the French astronomer Pierre-César Jules Janssen (1824-1907) used popular publications to introduce a wider audience to new fields of research such as astrophysics. In Victorian Britain, newspaper columns formed one of the “essential sites for the establishment of the new astronomy” which was based on observational techniques and the use of precise measuring tools and optical scientific instruments to examine the physical and

26 Camille Flammarion’s (1842-1925) best-selling work and one of the most popular and widely read books on astronomy in fin-de-siècle Italy had been translated into Italian and published as L’astronomia popolare: Descrizione generale del cielo as early as 1894 by the Milan-based publishing house Sonzogno. For further reading on Sonzogno, see Silvia Valisa, “Casa editrice Sonzogno. Mediazione culturale, circuiti del sapere ed innovazione tecnologica nell’Italia unificata (1861-1900),” in The Printed Media in Fin-de-siècle Italy: Publishers, Writers, and Readers, edited by Ann Hallamore Caesar, Gabriella Romani, and Jennifer Burns (London: Legenda, 2011), 90-106.

27 Govoni 2009, 22.

chemical properties of astronomical bodies. Moreover, “popular astronomers, much like the early astrophysicists, sought to convince their audience by combining aesthetics and science, appealing to the senses and to reason in what they saw as the tradition of the great Humboldt.”

Modern science, in particular astrophysics, changed how time and space were perceived while the scientific instruments and technologies produced to prove these new principles “helped transform the way [science was] culturally experienced.” By the end of the nineteenth century, contemporary science and technology had not only generated a large body of new knowledge about natural phenomena but had also amassed material objects such as drawings, photographs, apparatuses, and tools that could be infinitely reproduced and shown all around the world.

Another medium to present the most recent achievements in science and technology, including the apparatuses and machines that made many of them possible, were large-scale national and international expositions that took place at regular intervals during the late nineteenth and early twentieth centuries. These fairs provided the visitor with a thematic survey of either a specific industry such as electricity or photography or the state of scientific and technological research and industrial progress seen globally. Like daily newspapers, illustrated periodicals, and books, these expositions were fashioned to attract both experts and the broader public. In Italy, the Esposizione Internazionale di Elettricità (International exhibition of electricity) organized in Turin in late May 1884 (fig. 10) and the Esposizione d’elettricità e dell’industria serica (Exhibition of electricity and silk industry) organized in Como in the

29 Bigg 2010, 306.
30 Ibid., 310.
summer of 1899 were examples of fairs dedicated to one single industry (fig. 11). The 1900 Exposition Universelle in Paris, on the other hand, was in many respects the culmination of the diverse technological, scientific, and cultural innovations achieved around the world during the previous century. In addition to the over fifty million visitors who came to see the Paris exposition between April 14 and November 12, 1900—Balla among them—the publication of images documenting the breakthrough research and machine inventions presented in and around the exhibition disseminated the latest achievements on a massive scale. For example, to exhibit French efforts in the field of photography at the Exposition Universelle, photographic apparatuses and instruments were displayed in precious Art Nouveau-style glass cabinets according to the medium’s history, material components, application, and products (fig. 12).

But even before such exposure, Balla encountered photography and other methods used to reproduce images mechanically at an early age. In fin-de-siècle Italy, Turin was considered the center of Italian photography and the birthplace of Italian cinema. Balla’s father, Giovanni Balla (1840-1878), who had a deep-seated interest in camerawork, passed on his enthusiasm for this new image-making technology to his son. Moreover, as a gateway to France and

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32 Giovanni Lista speculates that Balla’s mother, who was deeply invested in the education of her son, encouraged Balla to visit the 1884 Esposizione Internazionale di Elettricità at the age of thirteen. Yet Lista does not provide any evidence to support his speculation. See Giovanni Lista, “Divisionismo e visione fotografica,” in Balla: La modernità futurista, edited by Giovanni Lista, Paolo Baldacci, and Livia Velani (Milan: Skira editore, 2008), 2. The Esposizione d’elettricità e dell’industria serica (Exhibition of electricity and silk industry) of 1899 was reviewed in Emporium. See P. Casanova, “Esposizioni: I. Esposizione d’elettricità e dell’industria serica a Como,” Emporium, vol. 9, no. 54 (June 1899), 463-470.


35 Giovanni Balla (1840-1878) worked as a chemist as well as in the textile and service industries in Turin. See Barnes Robinson 1981, 1, and Lista 2008, 1-2 respectively.
Switzerland, Turin was one of the first cities in Italy to witness many of the medium’s advancements generated by these nations. Balla’s mother, Lucia Gianotti-Balla, who worked as a seamstress in Turin, also ensured that her son would receive formal training as an artist by enrolling him in the Accademia Albertina di Belle Arti in November 1886 at age fifteen.\textsuperscript{36} Two years later, in November 1888, while registered in a three-year program known as the Corso Preparatorio, the painter began work with the lithographer Pietro Cassina at the Piazza San Carlo.\textsuperscript{37} Balla assisted Cassina in producing lithographic images for the tourist market. In 1891, the painter then moved on to work at the Studio Bertieri founded by the photographer and painter Pietro Paolo Bertieri, until he and his mother relocated to Rome in 1895.\textsuperscript{38}

During his apprenticeship at both Cassina’s workshop and Bertieri’s photo studio, Balla trained in various printing techniques, especially processes using color and photomechanical reproduction. Even though Balla’s first encounter with the work of the French physiologist Étienne-Jules Marey (1830-1904) is believed to have been at the 1898 Congresso Fotografico Nazionale (National photographic congress) in Turin and the 1900 Exposition Universelle, Giovanni Lista has recently argued that it was at Bertieri’s studio that the painter studied the photographic research and analyses of movement advanced by Marey, Eadweard James Muybridge (1830-1904), and Ernst Mach (1838-1916) through the perusal of popular scientific books and illustrated periodicals available to him there.\textsuperscript{39} It is not known which publications

\textsuperscript{36} Barnes Robinson 1981, 1, and Lista 2008, 2.

\textsuperscript{37} Lista 2008, 327.

\textsuperscript{38} Pietro Paolo Bertieri’s sons, Oreste (1870-1908) and Pilade Bertieri (1874-1965), were also close associates of Balla. Like his father, Oreste Bertieri worked as a professional portrait photographer at the Studio Bertieri. On Balla’s professional and personal relationship with the Bertieri family, see Lista 2008, esp. 3-6.

\textsuperscript{39} The authoritative texts on Balla’s encounter with the work of Étienne-Jules Marey (1830-1904) are by Marta Braun and Giovanni Lista. See Marta Braun, \textit{Picturing Time: The Work of Étienne-Jules Marey (1830-1904)}.
were accessible to Balla at Bertieri’s photo studio but in the spring and winter of 1892, soon after
the painter began working for the photographer, the Milanese journal *Il Dilettante di Fotografia:
Giornale popolare mensile illustrato* (1890-1908) published a fifteen-page article on Marey’s
work titled “La cronofotografia.” In addition to this article, Marey’s work found mention in
*Emporium* and was frequently discussed in illustrated periodicals such as *La Nature* and *Paris-
Photographe*, which would have circulated in Turin given the city’s ties to French culture.

After moving to Rome in 1895, Balla continued his involvement with photography and
the print media. He collaborated with magazines such as *Avanti! della Domenica* (Rome, 1903-
07) and *Novissima* (Milan, 1900?-10), and photographers such as Filippo Rocci (1881-1965) and
Giuseppe Primoli (1851-1927) frequented his studio. Like in *Emporium* and *L’Illustrazione
Italiana*, the content published in both of these journals emphasized the interrelatedness of
politics, science, technology, and art.

It was also in Rome that Balla befriended the astronomer Armando de Paolis. Although
it is not known in what context and when exactly the two men met initially, by late 1907, when

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41 Marey’s photographic studies are, for example, mentioned in a 1895 article “Le Fotografie Telegrafate” in
*Emporium*. For the article, see footnote 23 in this section. For additional information on early writings about
Marey’s work, see Braun 1992, esp. 425-437.

42 For further reading on *L’Avanti! della Domenica* and *Novissima*, see Lista 1984, 25-7. According to Susan Barnes
Robinson, the layout of *Novissima* was inspired by yet another foreign journal: the Austrian art journal *Ver Sacrum*

43 Giovanni Lista, for example, cites the column “Incontro al Nuovo: Note di Viaggio” in the first issue of
*Novissima*, which featured a discussion about the novel lighting system that had been used in the galleries of the
Palais de l’Electricité at the 1900 Exposition Universelle. See Lista 1984, 25. It is reasonable to assume that Balla
entered the Palais de l’Electricité to see its interior during his visit to the 1900 *Exposition Universelle* in Paris. For
the article in *Novissima*, see A. M. [possibly Alberto Micheli or Augusto Majani], “Incontro al nuovo: Note di
Viaggio,” *Novissima* (1901), unpaginated.

44 See footnote 4 in this section.
Balla began to pursue the painting of celestial light for the first time, he and De Paolis were meeting regularly to study the sky.\textsuperscript{45} A member of the Société astronomique en France (The astronomy society of France) since early 1905, De Paolis lived in a neighborhood near the painter’s home and owned his own observatory.\textsuperscript{46} It is likely that Balla learned of specialized scientific journals such as \textit{L’Astronomie: Bulletin de la Société de France et revue mensuelle d’astronomie, de météorologie et de physique du globe} (Paris, 1882 through at least 1987), to which De Paolis frequently contributed, through his astronomer friend. In fact, one can imagine the two men engaging in a sort of mutual exchange of expertise since both produced images depicting what they had observed while gazing at the starry firmament. Whereas De Paolis regularly submitted drawings and renditions depicting astronomical phenomena to journals like \textit{L’Astronomie}, Balla was intent on rendering the planets and stars in painting in novel ways.\textsuperscript{47}

Balla’s friendship with De Paolis as well as the knowledge that presumably passed between them

\textsuperscript{45} At the time, Balla was busy depicting the scintillating effect of the stars and nebula in a large-scale work entitled \textit{La costellazione di Orione} (henceforth \textit{The Orion Constellation}), which he later repainted. This painting is considered to be the first work devoted to a celestial theme within the painter’s oeuvre. In a passage following that in which she mentions her father observing the stars and the Orion constellation in particular, Elica Balla states, “Aveva un amico astrofilo, un certo de Paolis, con il quale faceva osservazioni astronomiche. L’astronomo aveva costruito un piccolo telescopio che aveva installato sul suo terrazzo, dove i due amici passavano ore felici nella osservazione del cielo. Naturalmente Balla fece il ritratto all’amico astronomo.” Balla’s portrait of Armando de Paolis, referred to by the painter’s younger daughter, has yet to be identified. See E. Balla 1984, 137.

\textsuperscript{46} De Paolis had become a member of the Société astronomique en France (The astronomy society of France) at the recommendation of Flammarion, who had founded the society on January 28, 1887, and his fellow astronomer and engineer Chrétien Édouard Caspari (1840-1918). See “Admissions et présentations,” \textit{L’Astronomie: Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe}, vol. 19 (1905), 68. An Italian branch of the society was established in Turin in 1907. As for his address, De Paolis was listed at 1, via Paolina, Rome, in the 1908 “Liste générale des membres” of the Société astronomique en France (The astronomical society of France). According to a later version of the members’ list, he had moved to 121, via Appia Nuova, Rome, by 1913. See “Société astronomique de France,” \textit{L’Astronomie: Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe}, vol. 22 (1908), 623, and “Société astronomique de France,” \textit{L’Astronomie: Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe}, vol. 27 (1913), 642, respectively.

\textsuperscript{47} It is noteworthy that the editors of \textit{L’Astronomie} praised De Paolis on his accomplished drawings of astronomical sightings on more than one occasion. See, for example, in “Nouvelles de la science, variétés,” \textit{L’Astronomie: Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe}, vol. 19 (1905), 293, and “Communications écrites,” \textit{L’Astronomie: Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe}, vol. 21 (1907), 472.
during their routine meetings would have a long and lasting effect on the painter’s vision of celestial light and motifs not least because of the access to the most recent findings and tools that the astronomer made available to him.

In addition to astronomy and the newly established field of astrophysics, electricity—the iconic symbol of modern technology—was one of the most popular themes featured at exhibitions and in printed ephemera during this period. In fact, lively competition amongst the organizers of international fairs generated ever more stunning and awe-inspiring displays, shows, and publications. As Wolfgang Schivelbusch explains, what fascinated visitors of, for example, the 1900 Exposition Universelle in equal measure was how through the addition of colored glass and paper as well as mirrors and textiles, among other materials, the appearance of ordinary electric light had been modified and diversified to create the illusion of a new environment. Contemporaries of Balla such as the journalist Gustave Geffroy (1855-1926) compared the nightly display at the Château d’Eau and the Palais de l’Electricité to “an avalanche of diamonds” capable of sending light “in [rippling] waves to the most distant, concealed corners of darkness.” Moreover, critics like Julius Meier-Graefe (1867-1935) noticed how electricity’s disembodied force assisted in creating an entirely different vision of the 1900 Paris exposition, remarking that at night “all palaces have morphed into bearers of light, everywhere little flashes

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49 The fée d’électricité or light fairy served not only as a symbol for the 1900 Exposition Universelle but was a standard image used to advertise and promote the use of electricity. See Wolfgang Schivelbusch, Licht, Schein und Wahn: Auftritte der elektrischen Beleuchtung im 20. Jahrhundert (Berlin: Ernst & Sohn, 1992), 17.

accentuate the main outlines of the buildings.” What transfixed Geffroy and Meier-Graef alike was the way in which the colorful delineating electric light transformed a concrete building into a fleeting view of the modern city. This process of transformation was attributed to, as well as personified by, the popular figure of the fée d’electricité or light fairy, whose “magical” powers in creating light effects differed decisively from those accomplished using other types of exterior spotlights. In addition, electricity also affected how visitors traveled around the 1900 Exposition Universelle through such exciting choices as the trottoir roulant, or moving sidewalk, and a newly installed electric train, which had been illustrated in the September issue of Emporium in conjunction with a lengthy article on the international fair (fig. 13). To the visitors of fair grounds and exhibition halls, it became evident that the new source of energy, above any other technological advancement, was the most highly prized currency of the new century. Indeed, it epitomized the spirit of early twentieth-century modernism: electricity was transformative and allowed for new forms of literary and pictorial expressions.

Geared toward the consumer and meant to entice the public to switch to using electric lighting at home, the application of artificial light as visual entertainment (referred to as “illumination arts” in the remainder of this chapter) also attracted a number of publishers. While regular black-and-white photographs captured the white glare of electric light (fig. 14), such images were inept at fully conveying the colorful effects of the illumination arts employed at the most lavish fairs such as the 1900 Exposition Universelle in Paris. There, every evening, at the touch of a finger, the waterworks and fountains of the Château d’Eau were illuminated in various


52 It is not unreasonable to think that Balla may have seen the article published in Emporium before departing for Paris that month. See “L’Esposizione Mondiale di Parigi,” Emporium, vol. 12, no. 69 (September 1900), 241-54.
colors, and thousands of incandescent light bulbs lit up the façade of the Palais de l’Electricité, making them the fair’s principal landmarks. The clever publishers sensed a business opportunity in marketing print products that translated visually the glamorous extravaganza, especially for those who could not see the spectacle for themselves. With the helping hand of artists and illustrators, publishers explored novel ways to replicate the ephemeral nature of the illumination arts in still images.

One of the techniques circulated specifically on the occasion of the 1900 Exposition Universelle in Paris was the so-called hold-to-light illustrated postcard (fig. 15). Held manually against a light source, these die-cut color lithographs came to life with dots of yellow, red, blue, and green representing the different kinds of colored light effects installed along the Champ de Mars field. Mass-produced, the animated images of the hold-to-light postcards emerged as swift modes of communication in comparison with traditional publications such as catalogues or brochures or other technologies replicating the sensation of seeing night views of these sites. Other illustrations rendering the brilliant artifice of the illumination arts presented in Paris in 1900 used ground-up mica and tinfoil (fig. 16) or fluorescent ink for additional effect (fig. 17). The latter originated from one of the oldest techniques adopted to alter and manipulate light in

53 In 1879, Thomas A. Edison (1847-1930) invented the incandescent light bulb. By the late nineteenth century, electric street-lights began to replace street lamps run on gas. For the evening shows at the Château d’Eau and the Palais de l’Electricité, see Schivelbusch 1992, esp. 17.

54 Frank Staff claims that the 1900 Exposition Universelle was instrumental in promoting and popularizing the wide and frequent use of illustrated postcards. See Frank Staff, The Picture Postcard and Its Origin (London: Lutterworth Press, 1966), esp. 63. In addition, Marian Klamkin notes, “for collectors of novelty cards, the Paris Exposition is noted for the issues of hold-to-light and other interesting novelty cards including some with inset transparencies.” Marian Klamkin, Picture Postcards (New York: Podd, Mead and Company, 1974), 65.

55 An illusionistic effect similar to that of the hold-to-light postcards had been achieved already in the 1860s with an apparatus called the megalethoscope. Invented in Venice by the Swiss-born optician and photographer Carlo Ponti (1823-1893), the megalethoscope was a bulky, stationary machine designed for looking at large, framed photographs of mostly urban scenes and landscapes. A precursor to the cinema, the megalethoscope allowed the viewer, who had to peak into a darkened box-like structure, to experience day-and-night effects of these photographs. I am grateful to Maria Antonella Pelizzari for drawing my attention to this early form of entertainment technology.
photographic images: that of applying paint to either the print or the negative (a method called 
masking) by hand. In order to create the perfect image with the preferred light scenario, 
photographers made use of this technique to overcome “the distance […] between the picture one 
could take and the picture one wanted to make.”

Notwithstanding the extent of publications, exhibitions, and printed matter that 
popularized contemporary science and technology in fin-de-siècle Italy, Balla’s interest in these 
fields of research has been studied largely in relation to Italian Futurism and early twentieth-
century modernist art. However, a broader examination of the painter’s oeuvre indicates that he 
confronted the problem of representing the visual experience of light and movement, its physical 
appearance, and its mechanisms—the processes of reflection, transmission, and refraction—early 
on. His curiosity about late nineteenth-century scientific research, images and optical devices 
published in newspapers, illustrated periodicals, popular science books, exhibition displays, 
posters, and postcards dates back to his student years in Turin in the early 1890s and long before 
his adherence to the Futurist movement. More so than any other artist of that group, Balla 
assessed modernity and the changes it brought with it by continuously absorbing information 
about scientific and technological innovations in order to create a corresponding and 
appropriately modernist pictorial language. He could already see the future at hand.

56 Mia Fineman, “Picture Perfect,” in Faking It: Manipulated Photography Before Photoshop (New Haven and 
London: Yale University Press, 2012), 45. Various examples of such photographic images show that the desired 
picture sometimes required the photographer to turn a day sky into night.
CHAPTER 2
NIGHT AND DAY: GIACOMO BALLA’S PAINTING OF LIGHT

Today one already can dream of the future if one roams around the exhibition grounds at night.
Julius Meier-Graefe, 1901

The history of forms never stands still. There are periods of intensified impetus and periods of slower imaginative activity […] visibility crystallizes for the eye in certain forms. And each new form of crystallization brings a new aspect of world content to light.
Heinrich Wölfflin, 1915

Shortly after the *Exposition Universelle* had closed on November 12, 1900, Giacomo Balla wandered the streets of Paris. In a letter penned to his fiancée Elisa Marcucci a few days later, he recalled in enthusiastic detail the artificial splendor of electric light on display in stores and around the city. Electricity had revolutionized the experience of nighttime, and the 1900 fair had

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4 Whenever possible, the first mention of a historic individual in this thesis includes their life and death dates. In some cases, however, this information was not available. Balla’s letter to Elisa Marcucci dated November 17, 1900, is quoted and translated in Susan Barnes Robinson, *Giacomo Balla: Divisionism and Futurism, 1871-1912* (Michigan: UMI Research Press, 1981), 20.
highlighted its radical transformative effect. More so than any other technological innovation of
the late nineteenth century, the advent of electric power invested everyday life with new qualities
and wonderment. At the flick of a finger, this new source of energy could turn on a variety of
machines, facilitate work and consumption after nightfall, and power trains that moved
passengers more efficiently across urban centers than any other types of motorized vehicles.5
Illuminated signs touting dance halls among other types of entertainment sites now adorned the
façades and corners of Paris and other European cities. Judging by numerous statements Balla
made to his fiancée, the luminous effect of the small incandescent light bulbs used to construct
the large letters blinking from the signs attracted him as the urban flâneur. Invoking this
fascination with artificial light in highly visual language, he wrote to Marcucci, “the beauty is
that each moment they change color and position, and you can see all this coming and going
against the evening sky, black and gloomy like a tomb.”6 In another letter sent during this time,
the painter went on, “If [only] you could see the magnificence and lavishness of the carousels,
booths, etc. Everything is embellished in the Baroque style and gilded, silver-plated, [with]
mirrors and fabrics and electric light illuminations. At night all of it remains fantastic and
rowdy.”7 Indeed, Balla realized that Paris at night presented a cultural landscape that had

5 In addition to the trottoir roulant—or moving sidewalk—an electric train had been installed at the 1900 Exposition
Universelle to move visitors from various points across the exhibition grounds. Around the turn of the twentieth
century, electric locomotives had also begun to replace steam engines used in underground public transportation
since they did not require the same elaborate ventilation system as those running on steam.

revisions were made to the published translation.

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genuinely entered into the modern age. By contrast, and as at least one critic who reviewed the 1900 fair noticed, its eclectic architecture appeared hideous and outdated during the day.⁸

The 1900 *Exposition Universelle* was in many respects the culmination of the diverse technological, scientific, and cultural innovations achieved around the globe during the previous century. The fair’s multifarious presentation was a kind of sum of all that science, technology, and the arts had accomplished at the threshold of the new century. For artists such as Balla, the fast-paced progress of science and technology that the nineteenth century had given birth to provided new tools that aided the human eye—most significant among them photography—and a new range of subjects for their art. The year 1900 revealed a multitude of new forms and facets through which to see and experience the internal and external physiognomy of the world. These new experiences—for example, of electric light illuminations (referred to as “illumination arts” in the remainder of this chapter) and electrically motorized public transportation—were groundbreaking because they contrasted remarkably with what had come before.

This chapter is concerned with the question of cultural renewal, always pressing for Italian artists in the post-Risorgimento period through the establishment of new modes of representation. The focus here is on how Balla—with his curiosity for science and technology fostered in positivist Italy during the first thirty years of his life—contributed to this renewal through the novel processes and iconography of his painting. Works such as his 1900 *Paris Fair* (fig. 4) and the late 1911 *Street Light* (fig. 2), which mark the beginning and end of the period under examination here, have heretofore been largely considered products of two separate

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⁸ Julius Meier-Graefe (1867-1935) was among the most critical reviewers of the architectural display at the 1900 Exposition Universelle. For his commentary on the Palais de l’Electricité, for example, see Meier-Graefe 1900, 22.
stylistic periods, Divisionism and Futurism. Interpretations of his oeuvre have pigeonholed *Paris Fair* as foreshadowing his later evolution, while *Street Light*—not least because it visualizes the catchphrase-turned-manifesto “Let’s Murder the Moonlight!” of 1909—has become one of the iconic images of Italian Futurism. A comparison of the two paintings shows how such a binary before-and-after viewpoint hinders a broader understanding of how early and how deeply science and technology had permeated Balla’s art. Likewise, interpretations of *Street Light* through the lens of Italian Futurism uphold the persistent view that Balla’s interest in scientific and technological advances resulted predominantly from his participation in the movement. After he joined Italian Futurism, Balla’s subject matter did become more focused on linking technological advances such as the speeding automobile, to his larger project of depicting light and movement. However, his positivist upbringing and faith in the scientific method coalesced with Futurist goals rather than being prompted by them. Indeed, he was compelled to look towards science and technology to achieve a new, transformative art as early as 1900. Over the years, his approach to art-making, which, first and foremost, was based on personal observation and grounded in his conviction to represent reality objectively, did not change after he associated himself with the Futurists. Instead, it was Futurism that recognized the prescience and relevance of his themes.

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9 Susan Barnes Robinson’s published dissertation *Giacomo Balla: Divisionism and Futurism, 1871-1912*, which examines the painter’s work until 1912 within the framework of Italian art prior to the declaration of the Manifesto of the Futurist Painters and the Futurist Painting: Technical Manifesto in 1910, is a rare exception. Most importantly, Barnes Robinson questions the approach among art historians of Balla’s oeuvre and Italian Futurism that frames his art up until 1912 primarily as a prelude to those works achieved after he had fully committed himself to and had been accepted into the movement in around 1913. This approach still prevails widely today. For her dissertation, see Barnes Robinson 1981.

10 Giovanni Lista, for example, argues that Balla’s *Paris Fair* “is of considerable importance due to the premonitory character which it occupies in relation to the later evolution of the artist,” but he may well have added its prescience with regard to Futurism. Lista 1982, 23. For the 1909 Futurist manifesto, see Filippo Tommaso Marinetti, “Let’s Murder the Moonlight! (1909),” in *Futurism: An Anthology*, edited by Lawrence Rainey, Christine Poggi, and Laura Wittman (New Haven and London: Yale University Press, 2009), 54-61.
In September 1900, Balla traveled to Paris at the invitation of his friend Serafino Macchiati (1861-1916), who worked as an illustrator for the publisher Alphonse Lemerre.\footnote{Lista 2008, 327. For a brief biographical entry on Serafino Macchiati (1861-1916), see Teresa Fiori, \textit{Archivi del Divisionismo}, vol. 1 (Rome: Officina Edizioni, 1969), 449.} Aside from the prospect of finding employment with Macchiati’s help, the painter intended to study the French masters and visit the 1900 \textit{Exposition Universelle}, which had opened on April 14.\footnote{Balla, letter to Marcucci, Paris, undated but probably September 1900, quoted and translated in Barnes Robinson 1981, 17-18.} It was during this months-long trip that Balla experienced firsthand the grand scale of the marvelous, new world that science and technology had unveiled.\footnote{The date traditionally given for Balla’s return from Paris to Italy is March 1901. However, it seems equally possible that the painter traveled back to Rome in time for his artistic debut at the 1901 exhibition of the Società degli Amatori e Cultori delle Belle Arti, which opened in February that year, as Susan Barnes Robinson has argued. Barnes Robinson 1981, 20.} Upon witnessing for himself the lavish splendor of the Parisian streets and the grounds of the 1900 \textit{Exposition Universelle}, Balla became inspired to paint the “fantastic and rowdy” atmosphere of a fairground at night and to produce “some drawings for illustrations.”\footnote{Balla in an undated letter to Elisa Marcucci, Paris, quoted and translated in Barnes Robinson 1981, 20. Minor revisions were made to the published translation. None of the drawings mentioned in Balla’s letter are documented in Giovanni Lista’s two-volume \textit{catalogue raisonné} of the painter’s work. See Lista 1982 and 1984.}

The visual impressions generated by the artifice of electric light presented in urban centers and exhibitions at the time appealed to the aesthetic sensibility of Balla and his Italian peers, especially given the scientific Neo-Impressionist style that had influenced them. As a Divisionist painter, he was trained to re-create light effects by separating colors and using broken brushstrokes in a range of sizes and shapes. For him, the steady light of electricity had eclipsed the romantic light of the moon. Illustrating a nighttime vision of two whizzing carousels at a fairground framed by the sparkling lights of an illuminated façade, the painting \textit{Paris Fair} encapsulates the electrified mood of the \textit{ville lumière} or City of Lights as the French capital had...
been dubbed since the eighteenth-century Enlightenment (fig. 4). The work is chief among numerous nocturnal views Balla produced between 1898 and 1904 precisely because of its emphasis on artificial light. Another, albeit lesser known, painting of a similar motif than Paris Fair is Il Circo forain (sic) (henceforth The Fair’s Circus, c. 1900; whereabouts unknown), which is confirmed only by a black-and-white reproduction published in 1998 by Balla scholar Maurizio Fagiolo dell’Arco (fig. 18). Scenes such as these offered Balla everything that had caught his eye’s attention while wandering around city streets, for the experience of seeing light, color, and movement became heightened when contrasted against the dark sky. The city was now up after dark, and entertainment businesses such as fairgrounds marked the beginning of a new era of urban modernity.

Paris Fair is a conventional horizontal landscape painting dedicated to the theme of a fairground at night. Balla probably sketched the composition, a symmetrical view of three busy amusement park rides, directly at the scene one evening in Paris in late 1900. Although traditional in its composition, which is defined by a distinct progression from foreground to middle ground to background, and the illusion of depth along a central axis, Paris Fair is novel in its rendition of a public space of popular entertainment at night illuminated by electric light.

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15 These paintings are among others Il Pertichino (henceforth The Spare Horse) of 1898 (Lista 1982, no. 19; believed to be lost); a painted postcard to Marcucci dated 1902 (Lista 1982, no. 51); Il lavoro (henceforth The Work) of 1902 (Lista 1982, no. 60); Notturno con un fanale (henceforth Night View with a Light) of c. 1902 (Lista 1982, no. 67); Notturno romano con lampion (henceforth Roman Night Scene with Street Lamp) of c. 1902 (Works by Giacomo Balla from 1905 to 1928, 1986, no. 1); and La giornata dell’operaio (henceforth A Worker’s Day) of 1904 (Lista 1982, no. 89).


17 Understood generally as foreshadowing the subsequent evolution of the painter’s subject matter and style, in the literature little attention has been paid to the formal and thematic organization of Paris Fair and its meaning within Balla’s broader oeuvre. Paris Fair is recorded in Fiori 1969, vol. 2, 137, no. X.24, fig. 1696, as La Fiera di Parigi or Luna Park as well as in Lista 1982, 106, 197, no. 22, as La Fiera di Parigi-Luna Park.
The joy of riding carousels long after sunset had only recently become available due to the installation of electric light and electricity in urban settings. Tellingly, it too precedes by a decade Balla’s quintessential Futurist image Street Light (fig. 2), also dedicated to the subject, but the artist felt compelled to backdate that picture on the canvas to 1909, likely to link it to the birth of Filippo Tommaso Marinetti’s movement. As indicated in his letters, Balla was interested in studying the appearance of objects as manifestations of different light effects and artificial illumination. The challenge lay in depicting the revolutionary force of electric light without falling back onto a standard iconography such as interior scenes. Balla’s contemporaries, chief among them Georges Seurat (1859-1891), Maurice Prendergast (1858-1924) and Louis Hayet (1864-1940), explored painting night scenes. However, their focus on the ambiance of nightly gatherings differed from that of the Italian painter, even though Hayet’s 1888 Fête foraine la nuit, la parade (henceforth Fair at Night, the Sideshow) (fig. 19) resembles the composition of The Fair’s Circus in some ways. In 1900, Balla arrived in Paris only after the retrospective of Seurat’s work at La Revue Blanche had already closed. This exhibition, which

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18 In the scholarship on Balla, the inscription “An. 1909” at the upper left corner of the recto, which was likely added at a later date, has been widely discussed vis-à-vis the date when the painter is actually believed to have executed the painting. There is no evidence that supports the painter’s claim in a letter to Alfred H. Barr Jr., dated April 24, 1954, that he painted Street Light in 1909. Balla, letter to Alfred H. Barr Jr., Rome, April 24, 1954, Alfred H. Barr Jr. Papers, Archives of the Museum of Modern Art, New York, I.A. 406; mf2189. On the contrary, there is wide-ranging agreement within the scholarly community that Street Light dates at least after Balla’s adherence to Italian Futurism in spring 1910 and more likely to late 1911. See, for example, Giorgio De Marchis, Giacomo Balla: L’Aura futurista (Turin: Giulio Einaudi editore, 1977), 18-19, Lista 1982, 33, and Christine Poggi, “Photogenic Abstraction: Giacomo Balla’s Iridescent Interpenetrations,” in Inventing Futurism: The Art and Politics of Artificial Optimism (Princeton and Oxford: Princeton University Press, 2009), 117.

19 Maurizio Fagiolo dell’Arco alludes to a connection between Balla’s motif and Seurat’s work in the brief caption that accompanied the black-and-white reproduction of Balla’s The Fair’s Circus. However, Fagiolo dell’Arco does not identify the specific work by Seurat that he had in mind. Instead, he describes the motif as depicting a booth similar to that depicted in The Fair’s Circus. See Casa Balla: Un pittore e le sue figlie tra futurismo e natura 1998, 15, no. 2.

20 See Georges Seurat (1860 [sic]–1891): Œuvres peintes et dessinées, (Paris: La Revue Blanche, 1900). The next time the painting was shown in Paris was in late 1908 and early 1909 at the Galerie Bernheim Jeune. A recent catalogue and exhibition titled Seurat’s Circus Sideshow and organized at the Metropolitan Museum of Art, New York, explored Seurat’s work within the context of nineteenth-century Paris and the socio-cultural changes France
ran from March 19 to April 5, 1900, included among other paintings Seurat’s important Parade de cirque (henceforth Circus Sideshow) of 1887-88 (fig. 20), which would have likely impressed Balla had he seen it at the time.

What distinguishes Seurat’s paintings of the parade or sideshow from Balla’s undertaking, however, might best be described as a difference of artistic sensibility in representing the visual experience of light. For Balla, painting Parisian nights in 1900 had less to do with capturing the emotive ambiance of performances and more to do with how such new light effects, those generated out in the streets by artificial illumination, could be represented in painting. With a quasi-scientific focus, Balla made the nocturnal atmosphere of an artificially illuminated fairground his ostensible subject because it allowed him to contemplate the optical effects of electric light as objectively as possible. Not only did Balla formally express the steadiness, brightness, and transformative effect of this strangely new illumination on buildings and color; he also depicted how this new source of energy could render forms and shapes out of light and indicated, through the color of the light, the different velocities emanating from two rotating carousels. In doing so, Balla was likely aided by his knowledge of photography, which is, broadly speaking, the play of light across a two-dimensional plane orchestrated to convey emotional and narrative meaning to the viewer.

As Balla told his fiancée in the letter penned in late 1900, a stroll across “a fair celebrating the victory of the Republic” inspired him to execute a painting dedicated to a pictorial representation of artificial illumination. Placed along the left and right edges of Paris underwent during this period. Interestingly and possibly as a result of the difference in artistic sensibility, neither Balla nor his Paris Fair are mentioned as part of this project. See Richard Thomson, with contributions by Susan Alyson Stein, Charlotte Hale, and Silvia A. Centeno, Seurat's Circus Sideshow (New York: Metropolitan Museum of Art, 2017).

21 Balla, letter to Marcucci, Paris, undated, quoted and translated in Barnes Robinson 1981, 20. Susan Barnes Robinson is one of very few scholars who have recognized that Balla depicted a fairground alongside or near the
*Paris Fair*, as this painting became known, two rotating carousels—one featuring dark panels mounted on a center pole and another with multiple rows of galloping horses—frame the liveliest section of the composition across a horizontal band in the middle ground. It is here that the rotation of the two carousels along the edges is contrasted with a bustling mass of human figures absorbed in darkness. Standing obscured before and around the carousels, these figures are difficult to make out. Easier to see in the immediate foreground is a hatted couple clad in dark garments marked by a few colorful accents—the woman’s belt and neckpiece as well as the collar of the man’s shirt—and fixed in the image directly across but slightly to the left of the building at center. Standing as such opposite to the central structure, the couple functions as an illusionistic device not unlike a *repoussoir* figure to create an impression of space. This sensation is heightened by the black and gray striations that run diagonally across the foreground outlining the shadows cast by the obscured figures that fill the middle ground. Like the couple, each set of striations—on the left and right of the picture plane in the foreground—directs the viewer’s gaze towards the three main sources of light in *Paris Fair*: the two whirling carousels and the building in the center.

As light radiates outward from these points of origin, it highlights certain sections of the painting but also decreases in intensity in other parts creating a remarkable contrast between light and dark. Unlike the carousels, whose light is mostly contained to the area between their respective platforms and canopies, the stationary structure in the center is made visible by the numerous illuminated lines, figures, and ornaments that correspond to the small light bulbs and lamps installed on its façade and those areas that remain dim. The effect of these blinking lights

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1900 *Exposition Universelle* as opposed to the Palais de l’Electricité itself. However, she does not further discuss the setting or the architecture of the fairground in detail.
had caught Balla’s attention earlier as indicated in another letter from this time.\textsuperscript{22} Next to the passage in the letter in which Balla marvels at this play of lights is a remarkable sketch of the word \textit{BAL} composed of a series of circles representing electric light bulbs. Although this French word likely referred to the name of one of the Parisian dance halls such as the famous cabaret \textit{Le Bal du Moulin Rouge}, it also corresponds to the first three letters of Balla’s name. Subtle as it may have been, this playful, self-referential gesture appears to signify that Balla identified himself and his work as a painter with electric light. For him, artificial illumination had not only altered his view of reality but also unfolded a “new aspect of world content,” a change in his art and in his life that he embraced enthusiastically.\textsuperscript{23}

In \textit{Paris Fair}, Balla uses a combination of different Divisionist brushstrokes ranging from long, thin lines applied mostly horizontally and diagonally to small, short marks in red, orange, yellow, and divergent hues of brown as well as scattered dabs of red paint. They are meant to capture not only the various visual manifestations of light but also to entice the viewer to imagine the dynamic movement and dazzling atmosphere of a fairground at night. To create a painted equivalent of the sensation of artificial illumination as he had envisioned it, Balla devised a diamond-shaped horizontal plane across the middle section of \textit{Paris Fair} to help the viewer follow the movement and compare and contrast fixed with fleeting lights. He placed two pairs of objects opposite in motion to each other along the four corners of the diamond-shaped

\textsuperscript{22} For Balla’s letter, see footnote 6 in this section. The letter itself or a reproduction thereof has not yet been made available to me.

\textsuperscript{23} The question about why and how Balla sought a new, appropriately modernist pictorial language in painting during this period, which is at the core of this thesis, relates to the much larger problem of how to explain “The Why of the Development” as formulated by Heinrich Wölfflin in the 1910s. In an attempt to explicate why and how changes in the perception of reality take place, Wölfflin reasoned that such transformation can be generated through both an internal or an external impulse and that there are certain moments in time that display an “intensified impetus” as he called it. As many scholars have argued, the transition from the nineteenth to the twentieth century was a period of unprecedented stimulus in the arts and sciences. I see the effects of the changes that the turn of the century brought with it playing out in Balla’s artistic practice as well as his work. See Wölfflin 1920, 248-9, translated by Jonathan Blower in Wölfflin 2015, 309-10.
plane. Whereas the left and right corners are occupied by the two rotating carousels, the diamond’s corners in the front and back of the picture plane are marked by the standing couple and the stationary building in the center respectively. The striations in the foreground as well as the globular lamps suspended from each of the three buildings guide the viewer’s gaze around the four corners of the diamond-shaped plane in a circular movement.

Furthermore, the viewer’s eyes are also directed to look from left to right and from top to bottom. The dense application of warm yellow brush marks around the mid-center and along the ceiling of the carousel on the left give the impression that the light in this area of the painting is more intense than elsewhere. Showing a brighter reflection of light than the other two structures, the carousel on the left thus appears closer to the viewer. Moreover, whereas the carousel on the left seems to operate at a comfortable speed, the one on the right appears to move somewhat faster, as indicated by horizontal marks applied along the carousel’s mid-section. Both structures emit light but at varying speeds and degrees of illumination. Although the primary emphasis on light lies in the painting’s middle ground, the artificial lights emitted from below also heavily illuminate the night sky, which is rendered in a reduced palette of various hues of brown, gray, and red. As Balla had observed in Italian Divisionist, French Impressionist and Neo-Impressionist painting, the use of divided brushstrokes of individual hues and shapes could mimic the fleeting appearance of bodies, structures, and objects when impacted by light in stationary images. However, in *Paris Fair*, he diverted from this pioneering path to visualize the mechanics of light, or more specifically artificial illumination, as objectively as possible. By rendering the painting’s formal elements of composition (with its circular structure), color, and
line expressive of the inherent dynamism of electric light, Balla made the energetic mood and sensation of the fairground palpable.\textsuperscript{24}

Although \textit{Paris Fair} has traditionally been interpreted as depicting the spectacular view of the Palais de l’Electricité at night, various details within Balla’s composition as well as external evidence suggest otherwise.\textsuperscript{25} At first sight, the central building in \textit{Paris Fair} might resemble the façade of that most iconic landmark of the 1900 \textit{Exposition Universelle} (fig. 13).\textsuperscript{26} However, when subjected to close scrutiny one notices that the structure represented in Balla’s painting does not live up to the commanding effect of the overlapping façades of the Château d’Eau and the Palais de l’Electricité, which had been erected one behind the other.\textsuperscript{27} Instead, what appears to be shown here is the exterior of a plainer building featuring an illuminated silhouette that does not quite correspond to the wide and classicizing vaulted entranceway of the Château d’Eau, which is flanked on either side by low arched colonnades, nor the massive shallow curve of the side façade of the Palais de l’Electricité.

Moreover, in his painting, Balla added a row of globular light fixtures, which hang suspended in mid-air, to the structure at the center. The painter also treated the area immediately

\textsuperscript{24} I owe this observation to Susan Barnes Robinson’s study of Balla’s Paris production. In addition to \textit{Paris Fair}, Balla also executed a portrait of a young woman walking while residing in Paris. Balla claimed, in a letter to Marcucci, to have succeeded in creating the illusion of forward movement in this painting, which is believed to have been lost. See Barnes Robinson 1981, esp. 22-23.


\textsuperscript{26} In 1984, Giovanni Lista implied in a footnote that Balla’s motif might have corresponded to the “back façade of the building [Palais de l’Electricité] overlooking the large space used for merry-go-rounds and other fun-fair attractions.” In the main text, however, Lista states, “In the picture called \textit{Fun-fair [Paris Fair (Luna Park)]}, which Balla painted during his stay in Paris in 1900, the Palais de l’Electricité appears in the background punctuated by lights in the dark night.” Further research is required to establish that a fairground was indeed installed along the backside of the Palais de l’Electricité. See Lista 1984, 115, n. 7.

\textsuperscript{27} Edmond Paulin (1848-1915) designed the Château d’Eau in collaboration with Eugène Hénard (1849-1923), who also devised the façade of the Palais de l’Electricité.
below these lamps by applying white, red, and blue highlights in long, horizontal brush marks to convey the illusion of movement. According to contemporary images, the Château d’Eau and the Palais de l’Electricité each featured such details but not in the particular arrangement in which they are shown in Balla’s painting. In addition, contemporary pictures of the site do not in any instance show carousels or other types of amusement rides installed in front of the Château d’Eau or the Palais de l’Electricité nor, for that matter, along the Champ de Mars field during the 1900 international fair (figs. 13-16 and 21).  

Instead, it seems that Balla’s composition constitutes an amalgamation of impressions the painter had gathered while wandering the streets of Paris and perusing illustrations of the city as published, for example, in photographic postcards. It is reasonable to assume that Balla would have shown an interest in these types of images since he had come to Paris in the hope of finding work by rendering views of the city for publication. The most varied repertoire of fairground views was assembled as part of an extensive, numbered series of postcards titled Tout Paris (Everything Paris), published around the turn of the century as well as later. One of the most widely reproduced fairs was the well-known Foire aux pains d’épices (Gingerbread fair) (figs. 22 and 23). A comparison with the imagery selected for these picture cards suggests that the central structure in Paris Fair could also have been inspired by the so-called montagnes russes circulaires—or circular roller coaster (fig. 24). These types of fair rides were modeled after so-called "montagnes russes" or "Russian mountains" that had first been built from ice or snow for 

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28 See footnote 30 in this section.

popular amusement in Russia. Wooden versions of these sliding hills were installed, for example, in the Gardens of Oranienbaum in Saint Petersburg in the late eighteenth century and were available in Paris by the beginning of the nineteenth century. The exterior of the montagnes russes circulaires found in Paris was heavily decorated and resembled more than anything the kokoshnik-type decoration found in Russian Orthodox churches. It is reasonable to think that designers or engineers specializing in the French amusement market chose a building profile that was emblematic of the Russian decorative tradition to emphasize the foreign origin of these rides.

Among other decorative elements, the overall structure of the montagnes russes circulaires typically displayed a figure atop the multi-arched pediment not unlike the star-shaped ornament atop the Palais de l’Electricité as well as a sculptural ensemble of three rearing horses positioned above the rounding board along the building’s central axis. Unlike the rest of the structure, the horses would remain unlit during the night leaving a spot of darkness in the middle of the façade (fig. 25). Interested in depicting the complex set of visual relationships present at a fairground at night—between light and dark, movement and stillness, crowdedness and emptiness—Balla chose this dark spot as the midpoint of his composition. A resting place of sorts for the viewer’s eye, the red, circular area at the painting’s mid-point not only gives off a calm within the noisy atmosphere of the fairground but also allows for a more concentrated contemplation of the various light sources depicted to the left and right and at the center. Indeed, neither the velocity of the two carousels nor the bustling ambiance at the fairground would be


31 I thank Anna Jozefacka for drawing my attention to this type of Russian architectural decoration; e-mail correspondence with the author, April 25, 2017.
easily discernable without the presence of the static building at the center. It is the central structure in Balla’s composition that keeps the scene depicted in *Paris Fair* from splitting into two independent images. Even more importantly, it perpetuates the kinetic sensation the viewer derives from looking at the image in a circular motion.

In *Paris Fair*, Balla rendered a scene that captured the pulse of modern life. By concentrating on the numerous ways in which electricity transformed an urban environment, the painter accentuated a visual experience that only recently had become available to the broader public. The painting’s motif embodies what everybody was marveling at during that time; and the couple standing in the foreground appears to be Balla’s invitation to join in the sensation. As a child in the 1870s and 1880s, the painter had experienced the revolution of artificial light and its widened use prompted by the invention of the incandescent light bulb by Thomas A. Edison (1874-1931) in 1879 as well as the introduction of central power stations. According to the memoirs published by the painter’s younger daughter Elica, Balla had held the American entrepreneur and inventor in high regard while growing up. According to her, Balla had apparently admired photographs depicting Edison on display in Turinese shop windows. Since Edison’s light bulb invention, electricity now could be used widely to power a variety of machines and other types of instruments in interior as well as exterior spaces.

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32 The electric light bulb had been developed since the beginning of the nineteenth century but Edison improved the technology in a way that light bulbs could be manufactured for a mass market.

33 She recalled, “circa in quei tempi o poco oltre si parlava molto di Edison e le sue fotografie erano esposte nei negozi: mio padre si fermava spesso ad osservare ammirato la intelligente e volitiva espressione di quel volto: Edison era l’inventore della lampada elettrica.” Elica Balla, *Con Balla*, vol. 1 (Milan: Mlithipla Edizioni, 1984), 29. Elica Balla was born in 1914, and her biography of her father is based on what he and other family members including her older sister Luce (1904-1994) shared with her. In addition, Elica Balla drew on the Balla’s correspondence and writings as well as publications on and interviews with him. Her recollections are invaluable to any study of the painter’s work, but they are also vulnerable to the charge that they are founded on her second-hand memory, especially with regards to the period before World War I.
The uniqueness of Balla’s vision of electricity within the history of modernism cannot be overestimated. Among the works picturing fin-de-siècle urban entertainment produced by artists such as Seurat and Pablo Picasso, the specific motif in Paris Fair of whirling carousels at night finds very few, if any, precedents. Balla’s emphasis on the rapidly spreading application of electricity does not compare with Picasso’s bold rendering of the decadence and glamour at Le Moulin de la Galette (fig. 26) nor does it fit in well with Seurat’s deliberately planned compositions that appear suspended in time such as in Circus Sideshow despite the fact that Seurat and Balla shared a heightened interest in the pictorial representation of vision and the experience of light. The dazzling display of artificial lights at fairgrounds and the international expositions staged during the late nineteenth-century would only later entice the imagination of Western avant-garde artists such as Isaac Israëls (1865-1934) and Joseph Stella (1877-1946), whose paintings Luna Park from around 1913 and Battle of Lights, Coney Island, Mardi Gras (1913-14) are greatly indebted to Italian Futurism (figs. 27 and 28). Balla, however, paved the way with his painterly description of moving lights in Paris Fair.

At the outset, visitors to fairgrounds and amusement parks coveted the exciting thrills promised by the electricity-powered rides. Similarly to the experience of drifting away into the crowds populating the new boulevards and shopping galleries, the fairs also held the promise of escape. Modeled after his impressions but probably also other published illustrations, Balla invigorated the visual vocabulary of light effects by adding to the mix the novel iconography of an outdoor urban scene illuminated by artificial lighting. This reading of the new world of mass

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34 The meaning and nature of the phantasmagoric and imaginary architectures designed for world exhibitions, amusement parks, and fairgrounds since the beginning of the twentieth-century was explored in the 2010 exhibition Dreamlands organized at the Centre Georges Pompidou in Paris. On the subject of how the various Expositions Universelles functioned as such imagined spaces, see especially Pascal Ory, “Expositions Universelles de Paris, Espaces de l’imaginaire,” in Dreamlands: Des parcs d’attractions aux cités du futur, edited by Quentin Bajc and Didier Ottinger (Paris: Centre Georges Pompidou, 2010), 73-8.
leisure culture depicted in *Paris Fair* also provides a more nuanced perspective on the imagery devised later by other Futurist painters such as Umberto Boccioni, whose study of urban dynamism represented in paintings like the 1910 *Rissa in galleria* (henceforth *Riot in the Gallery*) (fig. 29) is anticipated in the earlier work of his teacher Balla (fig. 4).\(^{35}\) Moreover, Balla’s grasp for the invigorating potential of electric light as a subject matter in painting also predates some key tenets of Futurism, soon to be declared in various manifestoes. Remarkably, his art foreshadows a gesture in painting that the Futurists would call the “*dynamic sensation* itself, perpetuated as such.”\(^{36}\) A painting like *Paris Fair* already offered a viable solution to the avant-garde problem of liberating art from the representation of a moment in time “*which has been stopped;*” a concept the Futurists would reject.\(^{37}\)

By the time Balla adhered to the Futurist movement in spring 1910, his Divisionist technique had developed into a unique, emphatic, and tangible painterly expression.\(^{38}\) His brushstrokes rendering light had grown from the fluid, long lines and dabs of pigment discernible in *Paris Fair* to the more expressive marks visibly manifest in paintings executed in 1910-11. Light now emerged in concrete geometrical forms in works such as the fifteen-panel polyptych *Villa Borghese–Parco dei daini* (henceforth *Villa Borghese*) of 1910 (fig. 30), in which white circular marks crossed by yellow lines float across the sky in a dense network of brushstrokes (fig. 31), and *Street Light* (fig. 2). Over time, his work had evolved into ever more calculated compositional constructions to which art critics such as Arduino Colasanti (1877-

\(^{35}\) Umberto Boccioni (1882-1916) was Balla’s student in 1902. The two artists renewed their contact in 1909 when both of their work was included in a section dedicated to Italian art at the *Salon d’Automne* in Paris that year.


\(^{37}\) Ibid.

\(^{38}\) For a detailed discussion of the period leading up to Balla’s adherence to Italian Futurism, see the fourth chapter of Susan Barnes Robinson’s dissertation titled “Life and Work: 1903-1910.” Barnes Robinson 1981, 59-78.
1935) reacted with “indifference” despite, or precisely because of, Balla’s apparent “technical virtuosity.” Referring as such to the painter’s *Salutando* (*Gli addii scala* (*Saying Goodbye* [*The Stairwell of Farewells*]; henceforth *The Stairwell of Farewells*) of 1909-10 (fig. 32) in his review of the 1910 *L’Esposizione Internazionale d’Arte* (International art exhibition) published in *Emporium*, Colasanti identified a chief characteristic of Balla’s method amidst his larger project of visualizing the mechanics of light and movement. To Colasanti, *The Stairwell of Farewells*, although of “admirable perspective exactness” and “infallible calculation of light,” was overall “a bizarre experiment in which the artist wanted to pose a problem for the sake of solving it.”

Even though the composition of *The Stairwell of Farewells* is not primarily concerned with light, what Colasanti observed holds true for other—earlier as well as later—works by Balla that have artificial illumination as their main subject such as *Paris Fair* and *Street Light*. These are paintings that represent pictorial essays or as the art critic put it, “experiments” in which Balla articulated his vision of light in painting based on his personal observations as well as his knowledge of scientific and technological imagery circulating in the popular press. Moreover, each of these four works shows the painter sustaining his vision across different stylistic periods.

At the beginning of the 1910s, electricity had permeated deeply into everyday life across Europe and in Italy. The generations that had come after Balla, including that of his students, Boccioni and Gino Severini (1883-1966), no longer experienced this groundbreaking technological invention with the same sense of wonder that it had evoked in those who witnessed it around the turn of the century. What the younger generations knew far better was a mode of

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39 Quoted and translated in Barnes Robinson 1981, 71. For the original text, see Arduino Colasanti, “L’Esposizione Internazionale d’Arte in Roma,” *Emporium*, vol. 31, no. 185 (May 1910), 375-93.

40 Arduino Colasanti quoted and translated in Barnes Robinson 1981, 71. For the original text, see Colasanti 1910, 386. Minor revisions were made to the published translation.
living that had been exhilarated and accelerated by speeding automobiles, trains, and the advent of air travel. As passé as electric light may have seemed in comparison to those subjects around 1911, the idea of making artificial illumination tangible in painting still felt pertinent to Balla. His impulse towards light and movement dated back to his earliest works, among them Paris Fair, and even after he adhered to Italian Futurism, he continued to develop his aesthetic independently along the lines of that work.

Street Light (fig. 2), which is considered to be Balla’s first ‘purely’ Futurist work in various historical accounts, is reminiscent of a number of paintings that came before it but it also bears the mark of what lay ahead. Traditionally, the painter’s motif—consisting of a lit street lamp, a crescent moon, and the outline of an upright-standing incandescent light bulb—has been interpreted through the lens of the 1910 manifesto of Italian Futurist painting. The two main interpretive strands see the painting as, on the one hand, commemorating the founding of the Futurist movement the year before, and, on the other hand, symbolizing a new era for Italy. However, the premise of such readings is that Italian Futurism was something “new” for Balla and that his vision shifted in response. An examination of Balla’s work between 1900 and 1911

41 In fact, it was Balla who, in a letter to Alfred H. Barr Jr. (1902-1981) dated April 24, 1954, solidified the close link between the painting’s symbolism and the Futurist exaltation of artificial light. Balla, letter to Alfred H. Barr Jr., Rome, April 24, 1954, Alfred H. Barr Jr. Papers, The Museum of Modern Art Archives, New York, I.A.406; mf2189. An excerpt of Balla’s letter translated into English is also published in Virginia Dortch Dorazio, Giacomo Balla. An Album of his Life and Work (New York: Wittenborn & Co., 1969), unpaginated. A copy of the entire letter translated into English is also preserved in the Museum Collection Files of the Department of Painting and Sculpture, Museum of Modern Art Archives, New York. In the “Futurist Painting: Technical Manifesto,” the Futurist painters proclaimed, “The suffering of a man is of the same interest to us as the suffering of an electric lamp, which can feel pain, suffer tremors, and shriek with the most heartrending expressions of torment.” They went on to saying, “Your eyes, accustomed to semidarkness, will soon open to more radiant visions of light. The shadows that we shall paint will be more luminous than the highlights of our predecessors, and our pictures, next to those of the museums, will shine like blinding daylight compared with deepest night.” “Futurist Painting: Technical Manifesto,” 65-6.

provides a more nuanced account rather than merely one in which the painter’s vision evolved from the painting of light and movement in a quasi-scientific manner to the painting of light and movement as subject matter reflective of modern science. Such reading acknowledges that Balla, by early 1911, had reached an impasse and soon would enter into a period of transition but maintains that the painter’s process and interests continued to be guided by the same principles he had already established before adhering to the movement.

Although the motif of Street Light might suggest at first sight that the recent invention of electricity had rendered nature’s powerful effects obsolete, it also represents another “experiment” in a long line of studies Balla devoted to artificial light. In his letter to Barr decades later, he explained retrospectively that the painting was “scientific” because he had “tried to represent the light [by] separating the colors of which it is composed.” Indeed, the iterant throbbing of the V-shaped and semicircular darts that appear to be simultaneously rushing towards and away from the artificial light source at the heart of Street Light signal that Balla had embarked on a new path. However, he proceeded as in the case of Paris Fair by studying the space around him first. He told Barr in 1954 that the streetlight rendered in the painting corresponded to those installed at the Stazione Termini in Rome and which photographer and writer Virginia Dortch Dorazio documented in the 1950s (fig. 33).

One of the studies for Street Light (there are altogether eight known preparatory works for the painting) reveals that Balla also explored lantern lamps hanging from the façades of residential buildings near his home at the via Parioli (present-day via Paisiello) in addition to the

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43 See footnote 45 in this section.

44 Balla in his letter to Barr, see footnote 45 in this section. Dortch Dorazio 1969, unpagedinated, fig. 57. According to Giovanni Lista, Dortch Dorazio, in 1957, assigned a photographer to document the works, tools, and materials present in Balla’s apartment for the purposes of her study. See Lista 2008, 332.
arc lamps set up in front of the Stazione Termini. Executed on graph paper also found in other drawings for Street Light and which appears to correspond to a particular brand of taccuino or pocket-size notebook that Balla routinely carried with him, this study is inscribed “Vi 3 Cannelle 15” (fig. 34). The inscription likely refers to an address at via delle Tre Cannelle not far from the painter’s residence. Today, a view across the street still shows a lamp similar to the one depicted in Balla’s study hanging from the façade (fig. 35). However, the streetlight Balla ultimately selected for his painting was an upright-standing carbon-fed enclosed arc lamp produced by the Continental company Brunt & C., which maintained a branch in Milan.

Widely known as arc lamps, their name is misleading insofar as the arc corresponds to an electric arc or arc discharge that occurs when gas is broken down between two electrodes (in this case those made of carbon) rather than an actual bend in their lamp post. In the final painting, Balla, always the careful observer, rendered the continuous electrical discharge between the two electrodes as the area where the visible light is most luminous. Moreover, he emphasized this central spot in the composition by depicting a star-within-a-star shape from which the rest of the electric light emanates outward. Indeed, the light emitting from such arc lamps was coveted for its brightness and ability to illuminate large areas, which made them also particularly useful for the purpose of street lighting.

In Street Light, however, it is also Balla’s continued engagement with popular scientific and technological imagery that leads to the specificities of his composition. As Giovanni Lista pointed out, contemporary advertisements promoting the use of electric light might have served

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46 In addition to this work, other studies for the Street Light executed on this type of graph paper are Lista 1982, nos. 201, 205-07, and Fiori 1969,146, no. X.180.

47 Balla identified the company by name in his letter to Barr; see footnote 45 in this section.
as models for Balla’s motif of the electric light bulb.\footnote{Lista 1982, 32-33.} Such advertisements not only depicted the actual apparatus that promised to illuminate homes and factories but also exploited the image of the moon being surpassed by artificial light, a motif also found in Street Light (fig. 36). Furthermore, Balla’s distinct brushstrokes—made of pointy darts and semicircular marks—may have also been inspired by photographs illustrating the diffusion of light such as those of Comet Halley published in the April 1910 issue of Emporium (fig. 37).\footnote{Lista 1982, 32-33.}

By late 1911 Balla had devised a grid-like geometric pattern in a preparatory pencil study for Street Light (fig. 38; henceforth Drawing for Street Light) to picture the pictorial properties of light in painting. Not unlike a microscopic image of a specimen prepared by a scientist, Balla experimented with the V-shaped and semicircular marks that would eventually allow him to divide the colors in such a way that they corresponded to the experience of light simultaneously rushing towards and away from its artificial source. Additional lines of dashes run vertically across these marks, which enhances the grid-like appearance of the overall scheme. Horizontal in format, Drawing for Street Light also depicts the star motif found at the upper center of Street Light, which relates this study securely to the painting. As with works devoted to the subject of light that came before and after, the goal here was to translate pictorially the perception of optical phenomena as truthfully as possible in the final oil. Giovanni Lista has described this drive for empirical accuracy throughout Balla’s career as “a need to concretely test the logic that unites sight to the sensation to be transferred onto the canvas.”\footnote{Lista 1984, 49.} As in Paris Fair, Balla’s Street Light betrays the painter’s reliance on an iconography that originated in popular images of

\footnote{For the article in Emporium, see Isodoro Baroni, “Note scientifiche: Le Comete. Storia—Fantasia—Realtà,” Emporium, vol. 31, no. 184 (Bergamo, April 1910), 279-304.}

\footnote{Lista 1984, 49.}
science and technology in addition to his insistence on personal observation as the foundation for his artistic vision. The change that had occurred since painting Paris Fair, however, is that Balla’s on-going commitment to his process of amalgamating diverse visual sources to push painting towards new directions had opened a path towards abstraction.

Street Light, which at the time was referred to as Lumiére électrique, was first documented in the catalogue accompanying the Futurists’ international debut at the Galerie Bernheim Jeune in Paris in February 1912. According to the published checklist, the painting was the only work that Balla submitted to this exhibition that placed Futurist art in direct juxtaposition with the Parisian avant-garde—Picasso’s and Georges Braque’s Cubist work in particular—for the first time. Exhibitions like these are often an impetus for new production and most scholars today agree that Balla likely executed Street Light especially for the purpose of the Paris showing. The title published in the catalogue, Lumiére électrique—at once straightforward and symbolic—nonetheless exemplified the Futurist aspiration to subject art to

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51 The exhibition ran from February 5 through February 24, 1912. Les Peintres futuristes italiens, preface by Umberto Boccioni et al. (Paris: Galerie Bernheim Jeune, 1912), 30, no. 27. Although the painting is neither dated nor reproduced in the 1912 exhibition catalogue, in the literature on Balla, Street Light has been consistently identified as the work listed therein. See, for example, Giorgio de Marchis, Giacomo Balla (1871-1958) (Rome: De Luca Editore, 1972), 156, De Marchis 1977, 18-19, Lista 1984, 27-31, and Christine Poggi, “Photogenic Abstraction: Giacomo Balla’s Iridescent Interpenetrations,” in Inventing Futurism: The Art and Politics of Artificial Optimism (Princeton and Oxford: Princeton University Press, 2009), 117. According to the information published in the two existing catalogues raisonnés of Balla’s oeuvre (Lista 1982 and 1984), there is no other work that could possibly correspond to the painting referred to as Lumiére électrique prior to February 1912. Other works that depict street lights and predate the 1912 exhibition in Paris such as Paris Fair, Night View with a Light or A Worker’s Day (Lista 1982, nos. 22, 67, and 89 respectively) are either too figurative in style to have passed Futurist muster or take as their central theme the progression from natural light to artificial light during the course of a day rather than electric light specifically. Also, Balla would not begin to work on his motion studies dedicated to racing cars such as Automobile in corsa – velocità + luci (henceforth Speeding Automobile – Velocity + Light; Lista 1982 no. 307) and which included renditions of bright artificial lights until late 1912 to early 1913.

52 In the literature on Balla, the inscription “An. 1909” at the upper left corner of the recto, which was likely added at a later date, has been widely discussed vis-à-vis the date when the painter is actually believed to have executed the painting. There is no evidence that supports Balla’s claim, in a letter to Alfred H. Barr Jr., dated April 24, 1954, that he painted Street Light in 1909. For the letter, see footnote 45 in this section. On the contrary, there is wide-ranging agreement within the scholarly community that Street Light dates to at least after Balla’s adherence to Italian Futurism in spring 1910 and more likely to late 1911. See, for example, De Marchis 1977, 18-19, Lista 1982, 33, and Poggi 2009, 117. The argument that Balla dated the work “1909” on the recto in commemoration of the founding of the Futurist movement is convincing.
new, scientific subject matter as well as resonated with Marinetti’s 1909 rallying cry “Let’s Murder the Moonlight!” Balla would later claim, in his 1954 letter to Barr, that this call for “the end of romanticism in art” originated from this and other paintings of his. In the end, however, *Street Light* was excluded from the presentation in Paris probably due to Boccioni’s intervention who felt that it was not radical enough in the context of Parisian Cubism. The painting would not be revealed in public until a year later, in February 1913, when it was shown as part of the *Prima esposizione pittura futurista* (First Futurist painting exhibition) in Rome at the Teatro Costanzi. Balla had not shown with the Futurists prior to this event, and as Susan Barnes Robinson has pointed out, critics were drawn to the painter’s contribution, then titled *Lampada ad arco*. Particular attention was paid to the brushwork rendering luminosity and movement in the painting. After the exhibition had closed in Rome, *Street Light* continued to travel with a

53 Balla, letter to Alfred H. Barr Jr., Rome, April 24, 1954, Alfred H. Barr Jr. Papers, The Museum of Modern Art Archives, New York, I.A.406; mf2189. In this letter, which has been frequently cited in the literature, Balla explained the ideas and genesis of *Street Light* in response to a questionnaire Barr had sent him. For the 1909 manifesto “Let’s Murder the Moonlight!” written by Filippo Tommaso Marinetti (1876-1944), see footnote 10 in this section.

54 As Susan Barnes Robinson has shown, critics such as Louis Vauxcelles (1870-1943) and Guillaume Apollinaire (1880-1918) remarked upon Balla’s absence in their reviews of the exhibition. See Barnes Robinson 1981, 86-7 and 154, ns. 38-9. The reason for why his work was excluded in the end is not known definitively. See Marianne W. Martin, *Futurist Art and Theory, 1909-1915* (Oxford: Clarendon P., 1968), 173. Boccioni had encountered Pablo Picasso’s (1881-1973) and Georges Braque’s (1882-1963) Cubist work first hand during a trip to Paris a year before the Futurist exhibition opened at the Galerie Bernheim Jeune. His knowledge of Cubism likely led to the exclusion of Balla’s work. *Street Light* was also not featured in the subsequent Futurist exhibitions organized at London’s Sackville Gallery and at Der Sturm in Berlin in 1912. For an account of the Futurists’ exhibition tour across Europe, see Lilli Weissweiler, *Futuristen auf Europa-Tournee: Zur Vorgeschichte, Konzeption und Rezeption der Ausstellungen futuristischer Malerei, 1911-1913* (Bielefeld: Transcript, 2009).

55 *Prima esposizione pittura futurista, Roma: Ridotto del Teatro Costanzi, Galleria G. Giosi*, preface by Umberto Boccioni et al. (Rome: La Galleria, 1913), 27, no. 3. The exhibition ran from February 21 to March 21, 1913. This is the earliest documentation for the painting’s Italian title *Lampada ad arco*.

56 Barnes Robinson 1981, 87. As stated earlier, the title that the work was given in Rome, which translates literally to *Arc Lamp*, describes a specific type of street light rather than an arch in the design of these lamps.
Futurist collection of paintings and sculptures to Rotterdam, where it was presented as Lampe électrique between May 18 and June 15, 1913.\(^{57}\)

Judging by its various titles, the meaning and actual subject matter of Balla’s composition in Street Light began to elude exhibition organizers shortly after the work had been shown in Paris. Although subtle, the change in titling the work first Lumière électrique and then Lampada ad arco and finally Lampe électrique suggests that the focus in interpreting the painting shifted from that of the rendition of artificial illumination to that of the object from which the light emanated. Such reading was in line with Marinetti’s and Boccioni’s Futurist rhetoric as well as Balla’s interest in anchoring his artistic legacy to Italian Futurism as outlined retrospectively in the painter’s letter to Alfred H. Barr, Jr. However, an understanding of the star shape in the composition’s upper center as “an ‘electric star’, that is, a planet created by man,” as Giovanni Lista has suggested, hinders an appreciation of Balla’s careful analysis and subsequent painterly execution of specific light effects, which is consistent with the process detectable in his earlier work.

Street Light continues to this day to be viewed primarily as a painting illustrating the broader contemporary theme of urban electricity erasing the light of the moon—or, to put it in words that correspond more closely to the transformation Italy underwent at the time, the theme of industrial progress, which aided by science and technology, would eventually overtake the largely agrarian Italy of the past. It also remains the painting that is most readily interpreted as a visual manifesto for Futurism. Such a reading, however, appears to stand counter, at least partially, to Balla’s long-standing intent to explore distinct aspects of light phenomena, day and night, across space and time, and in different atmospheric conditions.

\(^{57}\) Les Peintres et les sculpteurs futuristes italiens, preface by Umberto Boccioni et al. Rotterdam: Rotterdamsche Kunstkring, 1913, 27, no. 27.
Balla continued his exploration of representing light in painting with a series of methodical geometric renditions entitled *Iridescent Interpenetrations* (figs. 3, 39-41) towards the end of 1912.\(^{58}\) This new work marked the beginning of an experimental phase that eventually led to the full articulation of what art historians have described as Balla’s pioneering contribution to abstract art.\(^{59}\) Rather than artificial illumination, however, these pictorial experiments now extended further into the depiction of the basic properties of natural light as it is emitted or absorbed by a mass.

The painter had traveled to Germany twice in 1912 on a commission to decorate the summer home of his former student Grethel Löwenstein (born Margherita Cahn Speyer) and her husband Arthur Löwenstein located in the city of Düsseldorf.\(^{60}\) It was during his second trip from late October to mid-December that Balla embarked on the initial watercolors of the *Iridescent Interpenetrations* series. Inspired by occurrences he considered “indescribable by painting,” such as the reflection of mountains he had observed in the surface of a lake while crossing the Alps on his way to Germany, he considered rendering what lay hidden or was obscure.\(^{61}\)


\(^{60}\) Whenever possible, the first mention of a historic individual in this thesis includes their life and death dates. In some cases, however, this information was not available.

\(^{61}\) The painter mused about things in the world that are “indescribably by painting” in an undated letter to his family from Düsseldorf. The related excerpt reads: “Specialmente prima di arrivare al Gottardo, i laghi con i grandi monti che si riflettono nelle acque dai colori iridescenti sono di quegli effetti che è meglio considerarli indipingibili quando si pensa e si vede la proporzione di un uomo in relazione alle cose che lo circondano […]” Balla, letter to his family, Düsseldorf, undated but likely written in July 1912 when Balla had arrived in Düsseldorf, transcribed in *Ricostruzione di casa Balla*, edited by Paolo Baldacchi (Milan: Arnoldo Mondadori Editore, 1986), 164-5.
Early scholars of the painter’s work such as Giovanni Lista have argued that decorative designs associated with the various Secessionist movements and nineteenth-century color theories, in which Balla first became interested during his training as a Divisionist painter and again in 1912, provided a prototype for the colorful patterns of the *Iridescent Interpenetrations*. While this may have some merit, it disregards the lasting legacy of Divisionism, as more recent studies have argued, and the influence of a scientific method then widely discussed that anticipates Balla’s quest of capturing the experience of visible light onto the canvas. Known as spectral analysis, or spectroscopy, this method enabled scientists, beginning in 1859, to “break down light from a celestial body into a series of colored bands that reveal the elements it is composed of.” A decade later, leading scientists such as the Jesuit astronomer Angelo Secchi (1818-1878), who introduced spectroscopic observation methods to deconstruct and study the light of the stars and the Sun at the Observatory of the Roman College, had made far-reaching discoveries, which were immediately published in popular scientific books and journals. Although most commonly reproduced in black-and-white, Secchi’s celebrated 1870 study *Le Soleil*, which had been translated into Italian by 1877, included multiple color plates illustrating

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63 More recently, art historians Ester Coen and Christine Poggi have argued that Balla’s *Iridescent Interpenetrations* series owes to influences other than the decorative elements found in Secessionist motifs. See Poggi 2009, esp. 310, n. 62, and Coen 2012, esp. 125.


the spectroscopic images of numerous stars and celestial bodies (fig. 42). After all, spectroscopy had also assisted in establishing that a number of stars, instead of being white, appear in a variety of colors and color contrasts, which Flammarion likened to the “sparkling” of “all the tints of the rainbow.” Given the close resemblance that these spectra bear to Balla’s *Iridescent Interpenetrations* watercolors and paintings in terms of their subject matter, color scheme, and graphic representation it seems plausible to assume that the discovery of spectroscopy, at least in part, allowed Balla to further develop his abstraction. This is especially the case since it is likely that Armando de Paolis, Balla’s astronomer friend in Rome, would have discussed an important scientific method such as this one with the painter and also shared a copy of Secchi’s book with him.

Organized according to the color spectrum of visible light, which corresponds to that of the rainbow (a motif also associated with the *Iridescent Interpenetrations* and Balla’s writings during this period), the colored bands depicted in spectroscopic images reveal the chemical composition of a star in the form of black lines that intersect with the range of wavelengths (or six colors). Not unlike this scientific mapping of chemical elements through light, a narrow version of the *Iridescent Interpenetrations* that Balla executed around 1913 traces the vertical progression of a ray of sunlight by way of numerous intersecting triangular shapes (fig. 43).


Flammarion 1907, 630.

Giovanni Lista has described the painting’s motif as “traced on the motif of the ray of [the] Sun and the strip of light.” Entitled *Iridescent Interpenetration*, the painting is inscribed “A Cangiullo poeta futurista e amico mio Balla.” Francesco Cangiullo (1888-1977) was a Futurist poet and draftsman and regular visitor to Balla’s studio during this period. As Mario Finazzi notes, in a caricature entitled *La notte in via Paisiello* (the name of the street being a reference to Balla’s residence), Cangiullo places Balla in the context of his favorite pastime by depicting a view through the painter’s window. See Finazzi 2007, 211. The lit interior shows what is said to be a representation
this painting, a partially hidden pentagonal shape rendered in hues of red and orange signifies the Sun at the bottom of the canvas, while a beam of light, outlined in yellow diagonal and horizontal lines, ascends across various interlocking triangles in green, blue, and violet that can be interpreted as representing individual wavelengths of light seen through a spectroscope. Similar to telescopes, spectroscopes were also made of numerous lenses (installed inside a shaft) through which the light had to pass in order to be analyzed. Interestingly, one of the illustrations included in Secchi’s book shows the position of these lenses as a pattern of triangles (fig. 44). Although it cannot be known with certainty that Balla was aware of the method of spectral analysis and the devices that allowed for its application, spectroscopic images could have certainly provided him with another set of visual prototypes for his painting of light.

By the time Balla set out to work on the *Iridescent Interpenetrations* series, he had, for the most part, dispensed with recognizable subject matter or, more specifically, had condensed the pictorial properties of visible light to its essential components of color and synthesized lines of passage. Drawings for *Street Light* (fig. 38) and *Street Light* (fig. 2) demonstrate that the painter began to render luminosity through chromatic synthesis before entering the experimental phase of the years 1912 to 1914. Indeed, the transition from depicting real-world objects to depicting the essential attributes of light and movement as pure form took place progressively in Balla’s oeuvre since 1900 and was in dialogue with science. Most importantly, this was against the tide of Italian Futurism. Rather, the painter’s calculated method of testing and re-testing pictorial equivalents was conceived to represent the visual experience of light in painting. This
tradition already existed in the fine arts, and over the years it led him to articulate light by means of colorful patterns and repetitions of pure geometric shapes.
[...] the more faint, romantic, and sentimental art appeared to him [Balla] the more he looked for a reaction in a [state of] chagrin [of that style], protected by [and] inserted into a notion of reality that is scientifically exact. [...] It is an out-of-the-ordinary ability at the service of a scientific sensibility.

—Umberto Boccioni on Balla, 1916

Few avant-garde artists, who, like Balla, pioneered abstraction, made such productive use of scientific tools that augment human vision in their effort to renew art. For many years, the painter’s artistic vision had been shaped by empirical research into the visual experience of light and the pictorial representation of its basic properties. By 1913, this vision began to extend further into the painterly illustration of astronomical phenomena, which had first captured his imagination many years earlier. Balla’s life-long enthusiasm for astronomy, and his interest in the science explaining this specific area of knowledge, has been widely recognized. Only a few scholars, however, have systematically addressed how the painter arrived at the methodical geometric patterns present in, for example, the paintings of the *Celestial Orbits* and the *Mercury* series that he executed between 1913 and 1914 (figs. 5, 48-49 and 1, 53-65 respectively).

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1 “Quanto piú l’arte gli appariva dolce romantica sentimentale tanto piú egli cercava una reazione in una mortificazione serrato da innestato (in una nozione) scientificamente esatta della realtà. [...] È una abilità anormale servizio di una sensibilità scientifica.” Umberto Boccioni, “Balla,” in *Umberto Boccioni: Altri inediti e apparati critici*, edited by Zeno Biroli (Milan: Giangiacomo Feltrinelli Editore, 1972), 47. Boccioni’s text is fragmentary and also makes use of free syntax, which explains in part why the second half of the quote appears incoherent. I am thankful to Raffaele Bedarida for his suggestions on my translation.

2 In her recent study on the *Iridescent Interpenetrations* series, Christine Poggi argues that the schematic renditions of movement in the chronophotographs of Étienne-Jules Marey (1830-1904) not only served as prototypes for the painter’s numerous motion paintings of 1912 but also for this particular group of works. She claims that Marey’s images helped in “introduce[ing] a distinct element of mechanicity and repetition to his [Balla’s] art.” See Christine Poggi, “Photogenic Abstraction: Giacomo Balla’s *Iridescent Interpenetrations*,” in *Inventing Futurism: The Art and Politics of Artificial Optimism* (Princeton and Oxford: Princeton University Press, 2009), esp. 138-41. Flavio
Rendering celestial bodies and atmospheric interferences, the iconography of both groups illustrates the painter’s awareness of how contemporary scientists studied and pictured light and movement, on the one hand, and, on the other, how these scientific insights served him as models through which to express artistically the impermeable dimensions of the universe. Grounded in an analysis of a number of science publications, among them Camille Flammarion’s *Astronomie populaire, description générale du ciel* (1880) and a discussion of the recent discovery of spectroscopy on the part of the painter, the following examination of Balla’s painting of astronomical phenomena between 1907 and 1914 shows that the texts, schematic renditions, and scientific methods disseminated around the turn of the twentieth century functioned as theoretical and visual springboards for some of his most innovative work.  

As early as 1907, Balla had shown enthusiasm for watching and then painting the stars based on a scientific understanding of celestial light. Late that year he executed at least two works, a preparatory oil sketch and an oil painting, devoted to the theme of the Orion constellation, which he had observed one evening above a scaffold erected near his home.

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3 Camille Flammarion’s (1842-1925) best-selling work and one of the most popular and widely read books on astronomy in fin-de-siècle Italy had been translated into Italian by Ernesto Sergent-Marceau and published as *L’astronomia popolare: Descrizione generale del cielo* as early as 1894 by the Milan-based publishing house Sonzogno. Flavio Fergonzi among others cites Flammarion’s book in the context of Balla’s work. See Fergonzi 2003, 132.

4 *The Orion Constellation* painting is recorded in Teresa Fiori, *Archivi del Divisionismo*, vol. 2 (Rome: Officina Edizioni, 1969), 145, no. X.173. Therein, the painting is dated 1908 and listed as measuring around 175 x 120 cm (approximately 72 x 48 in.). The homonymous sketch, on the other hand, is documented in Enrico Crispolti, *Casa Balla e il futurismo a Roma* (Rome: Istituto Poligrafico e Zecca dello Stato / Liberia dello Stato, 1989), 197, fig. B/49a. It should be noted that, in early 1914, Balla’s friend and future collaborator Fortunato Depero (1892-1960) worked at the painter’s studio and used the verso of Balla’s oil sketch as a support for his painting *Ritmi di ballerina + clowns* (henceforth *Rhythms of a Ballerina + Clowns*; private collection, Rome). For a reproduction of Depero’s
Celebrated by Flammarion (an author Balla was likely familiar with) as the “richest in brilliant stars” and full of “treasures which no other is known to afford,” this constellation was also the painter’s favorite according to his younger daughter Elica Balla. According to her, Balla and his astronomer and friend, Armando De Paolis, regularly spent many hours gazing at the starry firmament together using a telescope that the latter had built and installed on the terrace of his residence in Rome near the painter’s home. What followed these routine observations was the production of images depicting what each of them had observed while studying the sky. In the case of Balla, his pronounced curiosity in how contemporary science and technology framed the experience of light and movement led to new ways of exploring the traditional theme of the starry night in painting. The depiction of celestial light in Balla’s pictorial representation of the Orion constellation, which is considered to be the first work devoted to an astronomical theme within the painter’s oeuvre, no longer reflects a vision of the heavens. Instead, his artistic attention to the scintillating effect of this particular star cluster mirrors that of scientists, who, at the time, engaged in explaining, mapping, and measuring in ever-greater detail the physical properties of light and the vast expanse of the universe.

It is not known when Balla began work on The Orion Constellation, a commanding painting measuring nearly six by four feet. By February 1908, the large canvas had been painted, see Crispolti 1989, 52 and 197, fig. B/49b. The dating adopted here is based on Susan Barnes Robinson’s argument that the painter may have been inspired by a photograph of the eponymous constellation published in the November 1907 issue of Emporium and her recommendation to date the painting to around 1907. See Susan Barnes Robinson, Giacomo Balla: Divisionism and Futurism, 1871-1912 (Michigan: UMI Research Press, 1981), 65 and 146, n. 29.


For a discussion of Armando de Paolis’s friendship with Balla, see, this thesis’s first chapter, esp. 31-2. For a mention of De Paolis in the literature on the painter, see Lista 1982, 69, and E. Balla 1984, 137.
included in the annual exhibition at the Società degli Amatori e Cultori in Rome. He later repainted it and it is known today only through numerous accounts including a passage in a review of the 1908 exhibition penned by art critic Vittorio Pica; a black-and-white installation photograph of the painter’s studio at via Parioli (present-day via Paisiello) in Rome taken around that time (fig. 45), and a considerably smaller sketch painted in oil on cardboard (henceforth sketch for The Orion Constellation; fig. 46). According to Pica, Balla’s composition conveyed the “nightly effect” and “delicacy of the throbbing light of distant stars” much like the photographs published in Emporium at the time (fig. 47), as Susan Barnes Robinson first suggested, and other contemporary illustrated periodicals. Similar to these photographs, the surviving preparatory sketch for The Orion Constellation depicts the light emitted from the stars of the eponymous constellation in a series of bright spots surrounded by differently sized light dots, which appear mostly in red and blue in the painting. Unlike these images, however, Balla divided the vertically oriented composition into two halves just above the horizontal midline in

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8 For Vittorio Pica’s review, see Vittorio Pica, “Arte contemporanea: l’Esposizione degli Amatori e Cultori d’Arte a Roma,” Emporium, vol. 27, no. 162 (June 1908), 405-26. In addition, a mention of The Orion Constellation can be found in an interview with the artist by Ugo Antonella and published in La Tribuna in August 1908. This interview is reprinted in Crispolti 1989, 137-138.


10 In 1989, Enrico Crispolti suggested this oil sketch as a possible study for Balla’s larger canvas The Orion Constellation. See Crispolti 1989, 197, figs. B/49a and B/49b. According to information recorded by Crispolti, the oil sketch measures 99 x 69.2 cm (39 x 27 1/8 in.). A color reproduction is published in Cosmos: From Goya to de Chirico, from Friedrich to Kiefer: Art in Pursuit of the Infinite, edited by Jean Clair (Milan: Bompiani, 2000), 266. Therein, the sketch is erroneously dated 1910.

11 Pica 1908, 410; quoted and translated in Barnes Robinson 1981, 146-7, n. 29. Susan Barnes Robinson was the first to draw attention to the relationship between the photographs published in Emporium and Balla’s The Orion Constellation. See Barnes Robinson 1981, 65 and 146, n. 29. For the article in Emporium, see “Note scientifiche: Come si fotografano le stelle,” Emporium, vol. 26, no. 25 (November 1907), 385-395.
order to represent two distinct views of the star cluster. Whereas the upper half is dedicated to a
direct glimpse of the constellation, the scene represented in the lower half appears to be, at least
in parts, its mirror image.

The fact that Balla divided the composition of *The Orion Constellation* into two equal
relates this work further to contemporary scientific studies insofar as it addresses the use of
devices that allowed scientists to penetrate more and more deeply the enormous space
surrounding Earth and the infinity of stars and nebulae that populate it. Indeed, when subjected
to close scrutiny the aforesaid oil sketch indicates, as Elica Balla remembered and Mario Finazzi
suggested, that Balla relied on observations achieved using a telescope to enhance his natural
vision.\(^{12}\) One indicator in support of such origins story is the ovoid space rendered in the upper
half of the canvas, which likely describes a frame of vision enclosed by a telescope with its
interior shown as a darkened band along the edges and lower part of the elliptical form. Another
clue might be the large size of the single bright star that appears as if magnified in the upper
center of the sketch.

The image that takes up the lower half of the sketch for *The Orion Constellation* further
endorses the idea that this particular view of the Orion constellation was inspired by science and
scientific instruments. It has been proposed that this picture constitutes a second study for the
final, larger painting of *The Orion Constellation* that Balla repainted.\(^{13}\) Although plausible, such
speculation does not fully explain the mirroring of the ovoid space and the bright star (which,
curiously, is doubled), and the series of red and blue dots visible in the upper half of the oil

\(^{12}\) See Mario Finazzi, “39. La costellazione di Orione,” in *In cima alle stelle: Viewing the Universe through Art, Archaeology and Science*, edited by Anna Albano (Milan: Silvana, 2007), 212. The observations that follow are indebted to Mario Finazzi’s analysis.

\(^{13}\) Finazzi 2007, 212.
The rectangular shape that encloses their reflection at the bottom, delineated by a light area at the lower right corner and a dark area along the left top corner and edge, possibly refers to a reflective surface such as a mirror. In an effort to minimize ocular aberrations, astronomers as well as amateurs like Balla employed so-called reflectors, or reflecting telescopes that use one or more objective mirrors instead of an objective lens (the lens through which the light passes first) to generate more accurate pictures. Balla’s friendship with De Paolis guaranteed him access to knowledge about the potential for observational errors as well as different kinds of telescopes that assisted scientists in avoiding them. The fact that the luminosity of the doubled star decreases from its reflection at the lower center to the one on the lower right and that the reflective image of the ovoid space in the lower part of the oil sketch appears overall smaller than on top also speaks to the relationship between these two seemingly disparate images. Furthermore, De Paolis knew Orion as an orange-colored star thanks to the study of its light using telescopes in combination with spectroscopy. This might help to explain the quick horizontal brushstrokes Balla applied dry in hues of black but mostly orange in the lower half of the composition. Rather than independent iterations of the Orion constellation, the two distinct views represented in the sketch demonstrate that the painter was eager to render multiple views of a given light phenomenon. By employing telescopic views in his painting early on, Balla, in conformity with an understanding of modernity that was firmly grounded in nineteenth-century positivism, emphasized the role that scientific devices supporting human vision played in fostering a novel modernist pictorial language.

14 This reading and the interpretation that follows precede an examination of the work in person.

15 See, for example, the chapter entitled “The Light of the Stars” in Flammarion 1907, 605-18.
Six years later, Balla moved on to painting a series entitled *Celestial Orbits* that is equally inspired by the use of a telescope and contemporary scientific illustrations. This group of works dating between 1913 and 1914 includes three remarkable paintings: the airy *Celestial Orbits* (fig. 5), the energetic tempera *Tutto si muove* (henceforth *Everything Moves*) (fig. 48) and the elaborate, now lost picture *Spessori d’atmosfera* (henceforth *Atmospheric Densities*) (fig. 49). A motif common to these works is a sequence of overlapping circles that move along a slight diagonal, further linked by orbs, S-curves, and spirals, which is meant to capture pictorially the progressive movement of a telescopic lens turned toward the sky and the energy of atmospheric interferences. According to Elica Balla, her father, in working on the *Atmospheric Densities*, used “a telescope pointed toward the azure atmosphere, analyzing the elements of focused and unfocused vision through the lenses; the artist want[ed] to fathom the mystery of that blue that was so unattainable, so divine for him.” However, rather than merely expressing its mysterious appearance, the pictorial language found in the works produced before and in 1914 evince that science aided Balla in creating innovative equivalents in painting that would convey the formidable luminous effects found in the Earth’s atmosphere without having to fall back onto figurative or symbolist suggestions and, instead, to synthesize their physical essence. The telescope not only helped him to perceive these distant sights but also allowed him to extract a visual frame that focused solely on the object of his observation: the hidden appearances and

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17 The *Tutto si muove* (henceforth *Everything Moves*) is Lista 1982, no. 305, and the *Celestial Orbits* and *Spessori d’atmosfera* (henceforth *Atmospheric Densities*) correspond to Lista 1982, nos. 309-310 respectively.

18 She writes, “[...] l’opera intitolata Spessori d’atmosfera, un curioso studio anche questo che faceva servendosi del cannocchiale puntato verso le azzurrità atmosferiche, analizzando gli elementi della visione a fuoco e fuori fuoco delle lenti; l’artista vuole scandagliare il mistero di quell’azzurro così irraggiungibile, così divino per lui.” E. Balla 1984, 291.
effects found out in the universe. This working method, noted by Giovanni Lista, distinguishes that of the scientist who first identifies and then extrapolates the phenomenon of his examination from the surroundings of its natural occurrence in order to study its properties in as neutral an environment as possible.\(^{19}\)

Similarly to the *Orion Constellation*, the iconography of the paintings in the *Celestial Orbits* series reflect on the perception of things, otherwise invisible, through modern science and the optical devices of magnification on which Balla relied. The progression of overlapping circles and the illustration of atmospheric effects rendered in the *Celestial Orbits* series and *Celestial Orbits, Everything Moves*, and *Atmospheric Densities* (figs. 5, 48-49) specifically are reminiscent of the omnipresent sequential pictures of, for example, the phases of the Moon or planet Venus, some of which De Paolis had submitted to *L’Astronomie* in 1908 (fig. 50).\(^{20}\)

Although it cannot be known whether Balla normally perused this particular scientific journal, several sets of images published in 1913 also show a striking visual resemblance to the orbs circumscribing the overlapping circles in the paintings of the *Celestial Orbits* series (figs. 51-52).\(^{21}\) Indeed, the main motif of the *Celestial Orbits* series articulates pictorially the visual experience of natural phenomena in a fashion similar to the methodical geometric images

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\(^{19}\) Giovanni Lista draws this parallel to the scientific method in his analysis of Balla’s motion studies dedicated to the dynamism of a racing automobile of 1913-1914. He writes, “He neutralized urban space by emptying the visual field of every figure which was not that of the linear and perpendicular displacement at the point of observation of the speeding motor car. These are working choices which denote the characteristic practice of scientific experience.” See Lista 1984, 49. For examples of works in this series, see among others, Lista 1982, nos. 294-301 and 303-04.

\(^{20}\) For Armando de Paolis’ drawing, see “Séance du 7 Octobre 1908,” *L’Astronomie; Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe*, vol. 22 (1908), 474, fig. 200.

\(^{21}\) These images include, for example, those rendering observations of the surface properties of planet Jupiter made by De Paolis in August 1913 and those produced with cinematographic technology during an expedition studying the Aurora Borealis, or northern lights. See “Observations de Jupiter en 1913,” *L’Astronomie; Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe*, vol. 27 (1913), 537, figs. 242-243, and *L’Astronomie; Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe*, vol. 27 (November 1913), 493, fig. 217.
published in *L’Astronomie* and other popular scientific books, including Flammarion’s *Astronomie populaire, description générale du ciel* (1880). They exemplify how closely Balla was in dialogue with the most recent findings issued by scientists.

Begun toward the end of 1914, the *Mercury* series defines another culminating moment in the painter’s rich production of images rendering the visual experience of light and movement in painting.²² Part of the large body of work devoted to astronomical phenomena and produced over the course of a few months before Italy entered World War I in May 1915, this series consists of at least fourteen drawings and paintings that vary widely in terms of medium and compositional complexity (figs. 1, 53-65).²³ These pictures, executed in pencil, ink, gouache, tempera, and oil, offer another view into the process through which Balla translated the familiar aspects of the visual experience into the language of painting.

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²² The most recent in-depth study of the *Mercurio passa davanti al sole* (*Mercury Passing Before the Sun*; henceforth *Mercury*) series was published by Flavio Fergonzi in conjunction with his larger research project on the collection of Gianni Mattioli (1903-1977). Fergonzi’s research relies on Maurizio Fagiolo dell’Arco’s 1997 study for a *catalogue raisonné* that examines Balla’s *Mercury* and *Atmosfera e orbite celesti* (henceforth *Atmosphere and Celestial Orbits*) series as part of the painter’s celestial themes dating between 1913-1920. See Maurizio Fagiolo dell’Arco, “*Esistere per dare*: Giacomo, Luce, Elica Balla,” in *Casa Balla: Un pittore e le sue figlie tra futurismo e natura* (Venice: Marsilio Editori, 1997), esp. 19-25, and Fergonzi 2003, 131-41. The earliest nocturnal view Balla is known to have executed is *Il Pertichino* (henceforth *The Spare Horse*) of 1898. The painting is believed to be lost. See Fiori 1969, 136, no. X.11, and Lista 1982, no. 19. In addition, Fergonzi argues that stylistic similarities between a number of the paintings in the series and those works by Balla that can be securely dated to 1914-15 suggest that the painter conceived of the main motif some time during the second half of 1914. See Fergonzi 2003, 131-32. Also, it should be noted that Elica Balla’s recollections of the series appear only in the second part of her memoir, which chronologically begins with World War I. See E. Balla 1984, 320-462.

²³ To date, the exact number of works belonging in the *Mercury* series is unknown. In the memoir of her father, Elica Balla (1914-1993) mentions two tempera paintings in addition to an unspecified amount of drawings and sketches. See E. Balla 1984, p. 346. In his 1997 study, Fagiolo dell’Arco lists fourteen studies, drawings, and paintings as part of the *Mercury* series. As suggested by Flavio Fergonzi, close examination of this group shows, however, that only twelve of these fourteen works appear to belong in the *Mercury* series. See Fagiolo dell’Arco 1997, 21-23, nos. 2-11, 13-14; and Fergonzi 2003, 135-6. The fourteenth work (Fagiolo dell’Arco 1997, no. 12 [recorded erroneously under caption no. 14]), features curvilinear forms that relate more closely, stylistically, to studies and paintings from 1917-18. In addition, two works—a pastel study and an ink drawing—that were not included in the documentation provided by Fagiolo dell’Arco and Fergonzi have been published elsewhere. For these works, see Crispolti 1989, 188, fig. B/14, and Painting in Italy, 1910s-1950s: Futurism, Abstraction, Concrete Art, curated by Gian Enzo Sperone and edited by Tania Pistone (Turin: Allemandi, 2015), 36, no. 25, respectively. Of the fourteen works that can be identified reliably as part of the *Mercury* series, only nine are recorded in Giovanni Lista’s two-volume *catalogue raisonné*. See Lista 1982, nos. 398-405 and Lista 1984, no. 1090. These nine exclude two drawings recorded in Fagiolo dell’Arco’s 1997 study, which are listed in the *Archivi del Futurismo*. See Maria Drudi Gambillo and Teresa Fiori, *Archivi del Futurismo*, vol. 2 (Rome: De Luca, 1962), 100, nos. 146, 149, and 159.
subject of stars and planets into a radically reductive, but conceptually complex vision of the universe, which, up to this point, had been shaped largely by biblical and romantic conceptions of the heavens.

Standard interpretation of the *Mercury* series has depended on the memoirs of Balla’s younger daughter Elica.\(^{24}\) As in the case of the *Orion Constellation*, Elica Balla, who was born in 1914, would have been too young to remember seeing her father at work on this particular group of drawings and paintings. Instead, one has to assume that her reading of the series’ main motif reflects at least in part that of the painter. In fact, an analysis of the relevant passage in her book suggests that the painter’s understanding of the difficulties in observing this specific event was informed by contemporary texts on the subject as well as his friendship with De Paolis. Writing years later, she observes, “The white Sun, which outside of the telescope would blind the eye, contrasts with the orange color of the flaming planet seen through the tinted glass.”\(^{25}\) Judging by her description of two of the key visual elements depicted in the series, Balla not only knew of

\(^{24}\) On the *Mercury* series, Elica Balla writes, “Ma quale cosa affascinante è stata l’osservazione del pianeta Mercurio mentre passava sul disco arancione del sole! Forse la nuova arte futurista gli permetterà di farne un quadro; le possibilità della ricerca che lo appassiona gli sembrano infinite e meravigliose. E traccia disegni e bozzetti in cui si sente l’artista che cerca di rendere gli oggetti con tecnica quasi aerea—non compatta—poi due tempere grandi l’una più sintetica con le linee che danno la sensazione del movimento dell’osservatore, al cannocchiale, il quale si sposta guardando fuori e dentro di esso. Queste linee si compenetrano con lo strumento e il sole. Il sole bianco, che fuori dell’oculare viene a ferire l’occhio, contrasta con il colore arancione del globo infocato attraverso il vetro nero. Forme e colori costituiscono un complesso pittorico nuovo essendo il soggetto molto sentito dall’artista e il cannocchiale ingigantisce – non è più il piccolo misero strumento ma è l’occhio più potente di quello dell’uomo che carpisce nel suo cerchio visivo il piccolissimo pianeta mentre passa davanti al disco giallo del sole” (“But what a fascinating thing the observation of planet Mercury was as it passed by the orange disk of the Sun. Perhaps the new Futurist art will allow him to turn it into a picture. The possibility of research for which he feels passionate seems endless and wonderful. And [he] traces drawings and sketches in which the artist seeks to render objects in a quasi-immaterial technique—rather than [a] compact [expression]—followed by two temperas that [expose] a more synthesized motif with lines that give the sensation of the movement of the observer, at the telescope, who puts himself in a position to see inside and outside of it. These lines interpenetrate with the instrument and the sun. The white sun, which outside of the telescope would blind the eye, contrasts with the orange color of the flaming planet seen through the tinted glass. Forms and colors constitute a new complex pictorial body, the subject most felt by the artist, while the telescope magnifies it: it is no longer the small, insignificant instrument but rather is an eye more powerful than human vision that captures in its visual circle the tiny planet as it passes before the yellow disk of the Sun.”). E. Balla 1984, 346-348.

\(^{25}\) Ibid. Adjectives such as “flaming” in the context of the Sun and other stars recur throughout Flammarion’s book.
the Sun’s glaring effect and protected himself against it before settling down to observe the event but also understood that the light emitted by the Sun would appear as color rather than as white. Indeed, “Mercury being but a small black point,” according to Flammarion, was “invisible to the naked eye on the dazzling sun” and “in such a state of contrast” jeopardized the collection of scientifically dependable data.26 De Paolis, who reported from Rome on the November 1914 transit, confirmed how challenging it had been to record the planet’s passage by remarking, “Mercury was very black. A thick cloud has prevented the observation of the last two contacts.”27

After witnessing Mercury’s passage across the Sun on November 7, 1914, Balla constructed an image based on geometric forms and colors that, according to the painter’s younger daughter, each represent pictorial equivalents of the various celestial bodies and immaterial matter that become exposed during the observation of this rare event.28 Whereas the overlapping circles and black dot symbolize the Sun, the darkened class of a telescope, and the transiting planet respectively, the interpenetrating spirals, orbs, and triangles illustrate, as Elica Balla says, the movement of the observer in front of the telescope as well as the progression of light through almost immaterial layers of atmospheric vapor, dust, and air.29

26 Flammarion 1907, 355. The use of italics reflects that present in the original.


28 Enrico Crispolti and Maria Drudi Gambillo were the first time to relate Balla’s Mercury series to the planet’s transit across the Sun on November 7, 1914. See Enrico Crispolti and Maria Drudi Gambillo, “Catalogo,” in Giacomo Balla (Turin: Galleria Civica d’Arte Moderna, 1963), 72, no. 108. Flavio Fergonzi provides further information on Mercury’s passage in 1914, which took place in Italy during the day. See Fergonzi 2003, esp. 132-33.

29 She writes, “[...] le linee che danno la sensazione del movimento dell’osservatore, al cannocchiale, il quale si sposta guardando fuori e dentro di esso” (“[...] lines that give the sensation of the movement of the observer, at the telescope, who puts himself in a position to see inside and outside of it”). E. Balla 1984, 346.
transparent cone and partially shaded cylindrical shape projecting downward from the circle that denotes the tinted lens, on the other hand, correspond respectively to an image of the telescope’s interior and exterior.\textsuperscript{30} However, none of the fourteen drawings and paintings in the Mercury series were exhibited or published before World War II. Hence, there is no contemporary evidence for the title Mercury Passing Before the Sun. It appears that Balla inscribed “Mercury Passing in front of the Sun Seen Through a Telescope” on the verso of at least two temperas and one oil painting, but this may have been done post-facto, much later in 1950, when renewed interest in the painter’s work prompted the publication of the large tempera in the Gianni Mattioli Collection in Milan (fig. 1) with the title Mercure passant devant le soleil in the acclaimed French art journal Cahiers d’Art.\textsuperscript{31}

Balla’s choice to render Mercury’s transit as seen through a telescope underscores the painter’s awareness of science. The observation and subsequent visualization of the passage required the use of vision-enhancing instruments, or else, the planet’s movement would not have been perceivable to him. Resorting to depict the inside and outside of the telescope’s shaft as well as the instrument’s tinted lens in all of the Mercury drawings and paintings accentuates the novelty Balla saw in the motif as well as the importance he ascribed to such instruments in order to monitor and render an astronomical event that is notoriously hard to see.\textsuperscript{32} In retrospect, his

\textsuperscript{30} Over the course of working on the Mercury series, Balla began to render a partially shaded cylindrical shape in light green to denote the material presence of the telescope within the pictorial field. Placed over the semi-transparent cone signifying the instrument’s interior, the telescope’s exterior starts to emerge in Fagiolo dell’Arco 1997, nos. 5, 7, 9, 11, 13 (erroneously listed under caption 12) and is most fully executed in nos. 6, 8, 10, 14 (erroneously listed under caption 13).

\textsuperscript{31} For the three works that are inscribed, see, Fagiolo dell’Arco, 1997, 22, nos. 6, 8, and 10. The 1950 article in Cahiers d’Art is cited in Fergonzi, 2003, 139.

\textsuperscript{32} With the exception of a small pencil drawing from a private collection, the semi-transparent cone denoting the interior of the telescope and the partially shaded, cylindrical shape are clearly visible in all of the Mercury drawings and paintings. What makes the instrument difficult to make out in this particular drawing even though the corresponding lines are present is the lack of sufficient shading. For this drawing, see Fagiolo dell’Arco 1997, no. 2. For a list of the entire series as it is known today, see footnote 23 in this section.
daughter reiterated this point. “The telescope,” Elica Balla writes, “magnifies it [Mercury]: it is no longer the small, insignificant instrument but rather is an eye more powerful than human vision that captures in its visual circle the tiny planet as it passes before the yellow disk of the Sun.”

Although Mercury, the tiny planet Elica Balla mentions, kept eluding De Paolis and others, turn-of-the-century science and technology had much improved earlier telescopic technologies. The advances made during the late nineteenth and early twentieth centuries triggered the growing awareness—among scientists as well as artists as Balla’s example illustrates—that humanity was capable of comprehending the most complex phenomena through the application of continued study.

More often than not formal analyses of the Mercury series have focused on the most elaborate and compositionally complex paintings in the group: the large temperas in the Mattioli Collection (fig. 1)—which is also considered to be the definitive version of the series—and the Museum Moderner Kunst Stiftung Ludwig in Vienna (fig. 64) as well as the albeit smaller version formerly in the Lydia and Harry Lewis Winston Collection (Dr. and Mrs. Barnett Malbin) (fig. 65). Each of these paintings features, although to varying degrees, dense layers of angular, circular, and triangular forms that culminate in the intricate image of the Mattioli tempera, which is considered the final work of the series. An analysis of the composition of the

33 E. Balla 1984, 346-8.

largest of the group’s three known pencil drawings (fig. 60) provides illuminating insight into how Balla may have arrived at the ultimate version by demonstrating that the Mercury motif constitutes, like other earlier paintings devoted to the theme of light, an amalgamation of images, methods, and technologies the painter had sourced from science.\textsuperscript{35}

Though modest in size, the preparatory study entitled Mercury Passing in Front of the Sun (henceforth Drawing for Mercury; Museum of Modern Art, New York; fig. 60) indicates that Balla expanded on his composition step-by-step, adding pictorial elements characteristic to the most complex versions of the series after he had established a primary scheme that defines, except for a few modifications here and there, all of the group’s drawings and paintings. Structured around a small and a large circle in the upper center, this primary scheme is composed of a spiraling band circumscribing the bigger of the two circles, a small, black dot depicted along or near the circumference of the large circle, and a shaded, semi-transparent cone projecting downward also from this circle. Diagonal lines, orbs, and hatched or colored areas that “interpenetrate with the instrument [the telescope] and the Sun” according to Elica Balla describe the remainder of the composition.\textsuperscript{36} More importantly, however, Drawing for Mercury shares with six other paintings in the group an array of zigzagging triangular shapes formed by chords, secants, and tangents that overlap and interpenetrate with the two circles in the upper left quadrant (figs. 1, 60-65).\textsuperscript{37} Indeed, these shapes that appear like a luminous star lie at the core of interpreting the main motif of the Mercury series as representing a simultaneous vision of, as the painter’s younger daughter put it, inside and outside the telescope.\textsuperscript{38} However, none of the other

\textsuperscript{35} These three drawings correspond to Fagiolo dell’Arco 1997, 21-22, nos. 2-4.

\textsuperscript{36} “Queste linee si compenetrano con lo strumento e il sole.” E. Balla 1984, 346.

\textsuperscript{37} For these works, see Fagiolo dell’Arco 1997, 21-23, nos. 4, 7-8, 10-11, and 13-14.

\textsuperscript{38} For the relevant passage in Elica Balla’s memoir, see footnote 24 in this section.
pencil, ink, pastel, and tempera studies present this shape. Instead they merely reproduce an image that represents the telescopically magnified view of Mercury and the painter’s process of monitoring it. If one chooses to see these studies as the earliest versions of the series’ main motif, the beginning of what eventually would become a highly elaborate abstract rendition of celestial light and movement, then one places additional emphasis on the fact that a technologically-assisted observation of something hidden provided the original impetus for Balla.

Aware of the alliance between art and science in Balla’s work, scholar Flavio Fergonzi has demonstrated that the painter probably consulted various scientific books and pamphlets in preparation of painting the Mercury series. These sources include photographs and diagrams that bear close resemblance to the primary scheme underlying this group of drawings and paintings as well as the zigzagging triangular forms intersecting with the circles in the upper left quadrant. In fact, when compared with one of the illustrations cited by Fergonzi as pertinent to the series, the drawing for Mercury appears almost as precisely executed as the actual scientific diagram. Most importantly, however, an analysis of contemporary scientific references emphasizes that although the Mercury series may well have been inspired by the actual event of the planet’s transit in early November 1914, the specificities of the composition and its facture are much indebted to previous astronomical events and methods such as the well-documented and widely popularized transit of planet Venus of 1874 and spectroscopy.

39 The studies that do not feature the zigzagging triangular shapes are Fagiolo dell’Arco 1997, 21-22, nos. 2-3, 5-6, and 9, Crispolti 1989, 188, fig. B/14, and Painting in Italy, 1910s-1950s: Futurism, Abstraction, Concrete Art 2015, 36, no. 25.

40 Fergonzi 2003, esp. 132-35 and figs. 2h-2i.
One of the visual sources that is said to have inspired the main motif of Balla’s *Mercury* series is a photographic image of the 1874 passage of planet Venus across the Sun by Pierre-César Jules Janssen, an astronomer working out of France (fig. 66).\[^{41}\] In his essay on the Mattioli tempera, Fergonzi mentions Janssen’s photographs as a possible origin for the *Mercury* motif, but explains that scientific sources of another kind might have been closer to Balla’s rendition, considering the “stark simplicity of [Janssen’s] images.”\[^{42}\] Yet, it is precisely the empirical simplicity that relates them to the diagrammatic quality of Balla’s work in addition to the painter’s long-standing interest in photography as an optical device enhancing human vision. This warrants a closer analysis.

In view of the technological and cultural advances during the late nineteenth and early twentieth centuries, the daguerreotype documenting Venus’ transit across the Sun in 1874 was described as a “scientific tournament.”\[^{43}\] It was particularly important to reproduce the event because previous recordings of the rare passages of Venus in 1761 and 1769 were of little scientific value. By contrast, the data gathered in 1874 allowed scientists to measure the distance between the Earth and the Sun—the solar parallax—for the first time. Janssen, like many of his contemporaries, tried to photograph the exact moment when the planetary disk and the solar disk came into contact with one another. In order to do so, he thought of recording their meeting in a series of sequential images, fixed on a circular daguerreotype plate, so that the exact moment of entry would not be missed.\[^{44}\] As Ann Thomas writes, “the visual highlight of the expedition was

\[^{41}\] Giovanni Lista, *Futurismo e Fotografia* (Milan: Multhipla Edizioni, 1979), 41.

\[^{42}\] Fergonzi 2003, 134-135.


produced by [Janssen], the man famous for pronouncing the photographic plate to be the retina of the scientist” —a metaphor which must have been much to Balla’s liking.45

Balla had several opportunities to encounter Janssen’s photographs before he began to work on the Mercury series. His familiarity with the visual recordings of this astronomical phenomenon arguably preconditioned his observation and depiction of the subject. Janssen’s images were exhibited at the 1900 Exposition Universelle in Paris where Balla also encountered Étienne-Jules Marey’s chronophotographs (fig. 12).46 Janssen’s photographic documentation of the 1874 Venus transit was discussed and reproduced in at least one of the catalogues published in conjunction with the 1900 exhibition.47 In addition, other scientific journals such as the French Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe, which would have been known to the painter through De Paolis, featured Janssen’s research and published similar sequential images illustrating Mercury’s 1907 passage across the Sun (fig. 67).48 In light of Balla’s use of Marey’s chronophotography in works preceding the Mercury series, it is noteworthy that Marey, in fact, developed his own photographic gun from Janssen’s apparatus with which he then used to document movements

45 Thomas 1997, 192.
46 As noted in one of the catalogue’s texts, Janssen’s pictures of the 1874 Venus transit were on display at the 1900 exposition. Indeed, Janssen’s circular daguerreotype plate appears to be visible in an installation photograph of one of the exhibition displays. The photographic plate was also reproduced in the accompanying catalogue. See Étienne-Jules Marey, “Exposition d’instruments et d’images: Relatifs à l’histoire de la chronophotographie,” in Musée rétrospectif de la classe 12. Photographie: (Matériel, procédés et produits) à l’Exposition universelle internationale de 1900, à Paris: rapport du Comité d’installation (Saint Cloud: Imprimerie Belin frères: ca. 1900), 10-11, figs. 1-2.
47 Ibid.
such as a running girl and a bird in flight. As an enthusiastic amateur photographer, Balla would have also seen the international scientific photography exhibition held alongside the Exposition Universelle in Rome in 1911, where Marey was a major participant. However, further research is needed to determine whether Janssen’s daguerreotypes, widely reproduced alongside Marey’s images in the immensely popular journal La Nature, were also exhibited there.

Besides the influence of Janssen’s photographic image, there are other scientific diagrams that suggest that Balla’s Mercury series depicts Venus, rather than the planet so far assumed. Scientific renditions of Venus’ transit were omnipresent in popular science books and illustrated periodicals around the turn of the twentieth century. The planet’s transit is also exceedingly similar to that of Mercury. Published in an astronomy manual written by the mathematician and astronomer Alfred Ferdinand Möbius (1790-1868), the specific diagram Fergonzi recognizes in Balla’s series depicts Venus’ transit in the form of a graphic computation. Specifically, it illustrates the various stages of the planet’s transit with respect to the Earth and the Sun, which Möbius represents as points “E” and “S” respectively (fig. 68). The resulting schematic image contains the spiral motif and a series of triangles that intersect with several circles, which the painter then elaborates on in his Mercury series. Balla’s pictures feature a similar positioning of

49 Braun 1992, 57.


52 Fergonzi claims that Möbius’ manual would have been “surely accessible to Balla on his trips to Düsseldorf in 1912-14.” Alfred Ferdinand Möbius’ (1790-1868) scientific diagram is discussed and reproduced in Fergonzi 2003, 135, 138, fig. 2i. Further research is required to verify that Balla had access to this particular publication but a comparison with other astronomy manuals demonstrates that diagrams of this kind were ubiquitous at the time. For the original reproduction, see Alfred Ferdinand Möbius, Astronomie. Grösse, Bewegung und Entfernung der Himmelskörper (Leipzig: Göschen, 1906), 82, fig. 22.
the celestial bodies and movement at play: the black dot, which, according to Elica Balla represents the “tiny planet,” the smaller transparent circle that signifies the Sun, and the larger circle, which represents the tinted telescopic lens.\(^5\) Indeed, a careful analysis of Drawing for Mercury confirms that Balla executed the two largest circles—those representing the Sun and the telescope’s glass eye—using a compass as evidenced by the pinholes at their centers.\(^6\) The employment of such a drafting tool ensured that compositional elements were drawn mathematically correct.

Interpenetrating the two larger circles in Balla’s drawing is an array of zigzagging triangular shapes that has commonly been interpreted as representing the refraction of the Sun’s rays during Mercury’s transit, especially when witnessed without a protective device such as a smoked lens. The comparison with Möbius’ diagram supports the hypothesis that Balla took inspiration from scientific renderings in order to formulate pictorial solutions expressive of the visual experience of light. Such a diagram shows that the triangles represent the scientific calculation of the duration of the planet’s transfer as opposed to the refraction of sunlight when observed with bare eyes.

Another compositional detail that hints at Balla’s awareness of Möbius’s diagram is a tear-shaped area deliberately left blank around the main event—the planetary passage before the Sun—in a number of studies. Balla would have had access to this example during several trips to Germany in 1912 and 1914 as well as through De Paolis. This tear-shaped enclosure is unique to

\(^5\) “[…] il piccolissimo pianeta mentre passa davanti al disco giallo del sole.” E. Balla 1984, 348.

\(^6\) A third pinhole further below and to the left of the larger circle suggests that an additional orb, springing off from the arc of the circle delineating the Sun, was intended but not executed; or it was the result of an originally inaccurate placement of the compass. I examined Drawing for Mercury during a visit at the Department of Prints and Drawings at the Museum of Modern Art as part of a research methods seminar lead by Emily Braun on October 14, 2008. The Museum’s senior conservator Karl Buchberg confirmed that the punctures found on the drawing were most likely caused by a compass.
the Drawing for Mercury and one other pencil study (figs. 60, 54 respectively) for in the subsequent studies it transforms into the spiral winding around the representation of the transit or remains hidden behind the illustration of the telescope. This nascent stage of a spiral trajectory (in combination with the triangular shapes in the upper left quadrant) corresponds again to the diagrammatic delineation of planet Venus’ transit as reproduced in Möbius’ manual. Here, the spiral springs off first from a point “10” and following a downward trajectory before sweeping upwards and then passing through points “3,” “2,” and “1” respectively. In turn, each of these three points represents one of the vertices of the triangular shapes rendered as overlapping the circles that signify the various celestial bodies and which Balla also adopted in his composition.

Additional graphic illustrations that may have served as a direct inspiration for Balla’s Mercury series were regularly reproduced in L’Astronomie, the scientific journal that frequently included De Paolis’ reports and drawings, as well as Flammarion’s bestseller Astronomie populaire, description générale du ciel. Each of these publications included scientific images that used shading and hatching as techniques to distinguish between different celestial bodies, their shadow images, and other appearances in a way similar as Balla’s tonal light effects in the majority of the Mercury pictures. It is reasonable to think that the painter was familiar with the visual content of astronomy books such as the one published by Flammarion, especially when considering how closely the latter’s description of Mercury’s transit across the Sun matches Elica Balla’s account. In one of his illustrations (fig. 69), for example, Flammarion conceptualized the formation of eclipses by illustrating the Sun, the Earth, and the Moon as mere

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55 As noted by Fergonzi, “The trajectory of Venus is a constant compositional element in the early studies of the series; the circular pattern of the orbits intersected by the triangles of merging lines resembles the motif of the curved lines.” See Fergonzi 2003, 135.
graphic renditions: disks and shapes that have no corporeality, not unlike the circles and the orbits revolving around them in Drawing for *Mercury*. As in this scientific image, the experience of depth in Balla’s studies generates from the abstract geometrical expressions of form and the stark contrast of light and dark.

Moreover, it appears that in conceiving the composition of the final images in the *Mercury* series, in particular the version that forms part of the Mattioli Collection (fig. 1), Balla also retrieved figurative solutions representing the visual experience of light he had developed under the influence of spectroscopy, a method that enabled scientists to break down light into colored bands, during the years leading up to 1914. The triangular patterns that interpenetrate the spiraling bands unfurling in centrifugal motion from the upper center toward the lower half of the Mattioli tempera originate in the graphic arrangement of arrows crossed by semicircular marks and concentric lines devised to separate the colors that make up visible light in *Street Light* (fig. 2). In turn, these triangles relate compositionally to the tabular arrangements of interlocking circles, lozenges, and triangles that characterize the *Iridescent Interpenetrations* of 1912-1914 (figs. 3, 39-41, 43). By formulating these graphic prototypes, Balla attempted to render the dazzling, luminous sensations generated when light refracts off a smooth surface such as the shade of a lamp or a body of water by applying the Divisionist technique of chromatic decomposition and the findings of spectral analysis. Spectroscopy, as developed by Secchi, generated precisely images of visible light in the form of colored bands that depict the chemical composition of a star as black lines that separate the range of wavelengths or six colors observable to the human eye (fig. 42).

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56 See, for example, Flammarion 1907, 183, fig. 66.

As Balla understood it from his early training, science, and his own empirical studies, when light is dispersed by a prism (the surface of a lake or the lens of a telescope or a spectroscope) it divides into the colors of the visible spectrum: violet, blue, green, yellow, orange, and red. Such color palette and its inherent simultaneous contrasts are found in the ultimate version of the *Mercury* series, the Mattioli tempera (fig. 1). In fact, the division of white light into its visible spectrum is represented figuratively in this painting. Balla expressed his meticulous observation of visible light by way of a zigzagging array of triangular shapes that collide partially with the large circle representing the telescopic lens in the upper left quadrant of the picture. To the right of these shapes, an orange and red colored spiral winds down and around the circle, growing wider and wider with each turn, thereby creating a sense of depth. Intermittent flashes of red, orange, yellow, and blue—depicted in the form of long, dryly applied brush strokes that seem to resemble visible light particles—are dispersed across its unfurling motion. Black outlines and shadows further delineate the spiral as the interior of the telescope. Varied patterns consisting of blue triangles, layered on across this underlying scheme on the left hand side and lower half of the Mattioli *Mercury*, also conjure up the idea of looking at light through something like a prism. When seen side-by-side, the color palette and geometric patterning of the composition display not only a close kinship to Balla’s earlier *Iridescent Interpenetrations* series but also to spectroscopic images insofar as light is synthesized as a progression of colors that are visible to the human eye. Knowledge of spectroscopic images would have allowed Balla not only to imagine abstract, geometrical configurations and sequences of motion as he did in the case of paintings produced in 1912, which were inspired by the chronophotographs of Marey, but also to understand theoretically how the experience of visible light could be recreated through multi-layered arrangements of shapes and paint.
The painter’s exploration of scientific instruments in the field of art echoes Flammarion’s belief in the contribution of vision-enhancing tools to all future discoveries. At the time, scientists, including him, De Paolis, and Janssen, were determined to confirm previous findings through the application of novel methods as well as to learn whether the planet closest to the Sun exhibits an atmosphere similar to that of Earth. With regards to Mercury, the scientific community was eager to find out why the planet appeared so black and to define the exact moments of its entry and exit into and from the Sun’s disk.\(^\text{58}\)

A final, larger question is raised by this examination of the *Mercury* series: why did Balla never execute a final version in oil of the motif as he did with his other series dating to 1913 and 1914 and depicting light and movement? The numerous preparatory studies suggest that he intended to produce a definitive picture of his *Mercury* motif. However, it appears that the outbreak of World War I in the summer of 1914 and the subsequent politicization of his work likely distracted Balla from doing so. Between 1914 and 1915, the painter started to devote his work to a political cause—the interventionist campaign led by the Futurists.

In 1973, art historian Marianne Martin related a pencil drawing on the back of the *Mercury* study formerly in the Lydia and Harry Lewis Winston Collection (Dr. and Mrs. Barnett Malbin) (fig. 65) to a group of works titled *Dimostrazioni interventiste* (henceforth *Interventionist Demonstrations*) and dated 1915, providing clear evidence that the two series overlapped, if only briefly, since the flag and other patriotic imagery of the latter series dominated his production through the rest of the year.\(^\text{59}\) As Fergonzi states, it is noteworthy that


\(^{59}\) Martin 1973, 52.
this double-sided work is “the only version traceable with certainty to a historic Futurist collection between the wars, that of [Benedetta and] Filippo Tommaso Marinetti.” In light of the interconnectedness of one of the Mercury studies with Balla’s subsequent Interventionist Demonstrations series, one can readily assume that the painter, newly engaged in interventionist politics, put aside the Mercury motif to focus on a more dynamic pictorial language that would support the campaign in favor of Italy’s entry into the war.

60 Fergonzi 2003, 131.

61 Interestingly, Susan Barnes Robinson points out that Balla also repainted the larger version of The Orion Constellation as well as other of his earlier works with quadri patriotici or patriotic paintings in around 1915. See Barnes Robinson 1981, 146, n. 27.
CONCLUSION

“[…] no other Futurist was as abstract as Balla, so long ago […]

—Arte Concreta (No. 2) published by the Movimento arte concreta (M.A.C.) in homage to Balla, December 1951

Giacomo Balla’s association with Italian Futurism has often been identified with an acute interest in scientific progress and a shift in subject matter. As I argue in this thesis, however, the themes of this painter’s work as well as the manner in which he treated them reflect a profound awareness of the way science and technology had changed and were continuing to change everyday life as early as 1900. An analysis of works produced from that year to 1914 shows that even his paintings of racing cars, the most Futurist subject Balla explored after joining the movement in 1910, are bound to his early experience of motorized travel at the turn of the twentieth century. I demonstrate that his scientific and objective analysis of reality originated from a deep-seated belief in European positivist culture and an interest and reception of a variety of scientific imagery, methods, and vision-enhancing devices, guided him toward a radically new and modern language in art: abstraction. By looking at science and technology as a source for knowledge, Balla not only preceded his Futurist peers in assessing the changes that modernity wrought upon perception but also exceeded the movements’ artistic findings. Unlike the Futurists, he made hardly any distinction between pictorial and scientific insight, which, in turn, enabled him to absorb the newest research and incorporate it in his pursuit of painting.

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Interestingly, it was the painter’s former student Umberto Boccioni who just before his death in 1916 theorized about Balla’s insistence on an objective view of reality that emerged most clearly in the geometric renditions of the *Iridescent Interpenetrations* and the *Mercury* series of the years 1913 and 1914 (figs. 3, 39-41, 43; and 1, 53-65 respectively). In a fragmentary text titled “Balla,” which the younger artist is said to have written the year he died, Boccioni argued that in order “to free himself from the preciousness of art as it was then intended in Rome, Balla saw no other outlet than plunging himself into a kind of scientific sensibility.”

Boccioni continued his musings by stating, “the more faint, romantic, and sentimental art appeared to him [Balla] the more he looked for a reaction in a [state of] chagrin [of that style], protected by [and] inserted into a notion of reality that is scientifically exact. […] It is an out-of-the-ordinary ability at the service of a scientific sensibility.”

The comments are all the more poignant, because a few years earlier, in the fall of 1913, Boccioni had engaged on behalf of the Futurists in a violent campaign against what he called “the grafomania of a positivist photographer of dynamism.” The young painter’s attack was directed, first and foremost, against Anton Giulio Bragaglia (1890-1960) and his photodynamism.

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3 “Quanto piú l’arte gli appariva dolce romantica sentimentale tanto piú egli cercava una reazione in una mortificazione serratato da innestato [in una nozione] scientificamente esatta della realtà. […] È una abilità anormale servizio di una sensibilità scientifica.” Boccioni 1972, 47. Boccioni’s text is fragmentary and also makes use of free syntax, which explains in part why the second half of the quote appears incoherent. I am thankful to Raffaele Bedarida for his suggestions on my translation.

but also against Bragaglia’s scientific forefather, Étienne-Jules Marey, whose graphic analyses of movement and chronophotography had served as an inspiration to a number of works Balla and other Futurist painters had produced between 1911 and 1913. In response to feeling vulnerable to the charge that Futurist painting had perhaps relied too heavily on photographic models and had merely succeeded in copying mechanically produced images, Boccioni, who had long become the leading spokesperson and theorist of the Futurist painters, rejected photodynamism entirely. In placing the subjective-emotive experience of universal dynamism at the center of his artistic project, he failed to see, at the time, the prescience of his teacher’s project in painting light and movement. Indeed Balla proved a far more radical artist than Boccioni in their respective degrees of abstraction.

Over the years, Balla’s perusal of Emporium, L’Illustrazione Italiana and other illustrated journals such as L’Astronomie sustained the painter’s deep-seated belief in scientific progress, his curiosity about astronomy as relayed by his younger daughter, and his fascination with tools that aid the human eye. The images and texts disseminated through periodicals of this kind emphasized the utility of science and empirical study as well as the importance of instruments that allowed for the perception and analysis of energy. In supplying a vast repertoire of visual prototypes, the illustrations of artificial and natural phenomena otherwise ungraspable or even invisible to the naked eye made novel scientific insights accessible to the layperson. Moreover, in promoting the notion of the amateur-scientist, the content of these publications suggested ways in which the reader could participate in the documentation of optical phenomena.

Inspired by the inquiries he had received from his readers, Flammarion felt compelled to conclude his 1880 book Astronomie populaire, description générale du ciel with a manual listing numerous types of telescopes and explaining how to use them for particular astronomical
sightings. He wrote, “It is not necessary to possess complicated and costly instruments in order to begin this study, and we may even remark that a large number of discoveries in physical astronomy have been made by amateurs with the aid of very modest instruments.” For Balla, who owned a pair of binoculars as well as a simple telescope, these vision-enhancing devices naturally became part of the artist’s toolbox alongside his brushes, ruler, and palette. The contemporary emphasis on the practicality of these instruments and their promise of revelation is noteworthy insofar as much of the published content, ranging from text to photographs to drawn and painted studies to diagrams and schematic renderings, was based on observations that had been made using telescopes or microscopes. Moreover, novel analytical techniques such as spectral analysis, or spectroscopy, enabled scientists to measure and study the light reflected, emitted, or absorbed by a mass such as a planet or a star and in turn determine its chemical composition.

Schematic renditions of artificial illumination and astronomical sightings were familiar to those who had studied and depicted light before Balla had concluded to paint street lamps, atmospheric interferences, and Mercury’s transit. What renders his artistic representation of light innovative is, on the one hand, the creation of what are ostensibly empirical records of the visual experience of luminous energy; and, on the other, the ways in which he exploited the potential of vision-enhancing instruments for the uses of art. As with earlier paintings seeking to capture artificially illuminated spaces, Balla approached his representation of artificial and celestial light and movement through precise study rather than intuitive process. In the case of The Orion Constellation (fig. 46) and the Celestial Orbits and Mercury series (figs. 5, 48-49; and 1, 53-65 respectively), in lieu of a Symbolist suggestion of the heavens, he chose to represent two

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intersecting points of view, as if simultaneously gazing at the sky through a telescope and with the unaided eye. The contrast resulting from such juxtaposition of diverging perspectives, both in terms of its visual effect and scholarly insight, allowed the painter to show a rare astronomical event known to elude even the most experienced scientist as well as to highlight the potential of vision-enhancing instruments in observing what is otherwise hidden. Hence, I maintain that for Balla, the representation of light surpassed the physical (and mental) experience of movement in space. Instead, what lies at the core of some of his most iconic works between 1900 and 1914 is an inquiry into the physical apparatus of perception: the human eye. Ultimately, the main question guiding his investigation—how to recreate artificial and natural luminosity with the means of paint and brush—led Balla on a path toward abstraction.

By the early twentieth century, a scientific understanding of the nature of things and the world as a whole had come into focus, less mysterious and more comprehensible, in large part because of the use of such scientific instruments and novel methods of observation. With the help of “eye[s] more powerful than human vision,” to use Elica Balla’s metaphor, the latter had advanced to a point where natural phenomena and laws that scientists of previous generations had explained were now proven or disproven. The progress made during the late nineteenth and early twentieth centuries triggered the growing awareness that humanity had made another extraordinary leap forward in comprehending the most complex phenomena through the application of scientific study. It is from this viewpoint that Balla’s reference to Leonardo da Vinci (1452-1519), the accomplished Renaissance painter, draftsman, scientist, and engineer,

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6 In her study on the development of Italian art over the course of five decades, Maria Antonella Pelizzari proposed a similar reading of Balla’s pictorial representations of light. According to Pelizzari, painting for Balla, “could render this type of optical phenomenon [light] and thus replace the iris of the eye.” See Pelizzari 2015, 15.

comes into focus. Imagining himself as a reincarnation of his predecessor, Balla wrote in an undated autobiographical note, “In 1500, I was called Leonardo. [...] after 4 centuries of artistic decadence, I reappeared in 1900 to shout to my plagiarizers that it is time to end it with the past because times have changed. [...] I have already created a new sensibility in art that is the expression of future times [...].” In the painter’s mind, not only was he part of a long lineage of artist-scientists working in Italy but he also had helped to propel painting onto a plateau that, decades later, was singled out as far ahead of its time.

In the late 1940s and early 1950s, artists committed to cultural renewal in Italy after the end of World War II, among them the group Movimento arte concreta (M.A.C.), recognized Balla’s early pursuit of abstract painting as the genesis of abstract art in this country. In homage to Balla, they wrote in late 1951, “Today, we are no longer interested in dynamism and simultaneity but we are struck by the fact that nobody, not even Kandinsky, nor Mondrian, nor Delaunay, was able to foresee, in such a perceptive manner [as Balla’s], the direction that painting would have taken more than forty years later.” In their eyes, their forefather’s pictorial experiments, which expressed a hyper-awareness of reality rather than a departure from reality,

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8 Balla’s admiration of Leonardo da Vinci (1452-1519) becomes apparent in a letter he sent to his family in 1912. Sitting in a temporary study in the Löwensteins’ residence in Düsseldorf, Balla fashioned himself an experimental scientist. He wrote, “I am here in my warm room seated at this little table with electric light, a set square, two boxes of colors, binoculars, a compass, a polished inkwell of flowered terracotta, some books: Dante, Leonardo, Hugo, Giacomo […]”. Balla, letter to his family, Düsseldorf, December 5, 1912, quoted and translated in Poggi 2009, p. 307, n. 38.

9 This important reference to the accomplished Renaissance painter, draftsman, scientist, and engineer appears in an autobiographical note in which the painter imagined himself as a reincarnation of his predecessor. Balla writes, “In 1500, I was called Leonardo. [...] after 4 centuries of artistic decadence, I reappeared in 1900 to shout to my plagiarizers that it is time to end it with the past because times have changed. [...] I have already created a new sensibility in art that is the expression of future times [...].” In the original Italian, the note states: “Autobiograf. Balla / Nel 500 mi chiamavo Leonardo o ... Tiziano dopo 4 secoli di decadenza artistica, son riapparso nel 900 per gridare ai miei plagiatori che e’ ora di finirla con il passato perchè son cambiati (sic) i tempi. Mi dissero pazzo: Poveri tonti !!!!!!!!!!! O già creato una nuova sensibilità nell'arte espressione dei tempi futuri che paranno (sic) colorradioiridesplendorideal luminosissississimiiiiii / FuturBalla.” A facsimile is reproduced in Maurizio Fagiolo dell’Arco, Omaggio a Balla (Milan: Bulzoni, 1967), 62.

10 Quoted and translated in Pelizzari 2015, 13.
not only exceeded the findings of Italian Futurism but also offered an understanding of abstraction that proved, on the whole, more influential for twentieth-century art. Engaged in a radical re-ordering of the post-1945 status quo in art and culture, the members of M.A.C. and others saw in Balla the pursuit of a type of creative interdisciplinary research that, long ago, had laid the foundation for a full plastic synthesis of the arts. A counterpoint to the social realism promoted in the arts by Italy’s communist party following World War II, his signified a kind of painting that was free in its expression, of its time, but, most importantly, the product of an engagement with new technologies that aided him in going beyond that what is visible or tangible. More concentrated research is needed to draw out why Balla, apart from being the only Futurist in the mix of the historical avant-garde invested in abstraction, stood out for the M.A.C. artists, who were engaged in concrete rather than abstract art, in particular.\footnote{The 2015 exhibition Painting in Italy, 1910s-1950s: Futurism, Abstraction, Concrete Art at the Sperone Westwater gallery in New York not only made an important case for Italian abstract painting but began to address this lacunae within the Anglo-American scholarship. See Pelizzari 2015.} Such an investigation might not only shed insight on why his approach was viewed as so unlike that of Delaunay, Kandinsky, and Mondrian in the context of post-1945 European art but also offer a deeper understanding of a strand within the history of abstraction that is committed to exploring painting’s most fundamental element itself: light.
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Fig. 1
*Mercurio transita davanti al sole (Mercury Passing Before the Sun)*, 1914
Tempera on paper with canvas
47 2/8 x 39 3/8 in. (120 x 100 cm)
Gianni Mattioli Collection, Milan
Fig. 2
*Lampada ad arco (Street Light)*, ca. 1911 (dated 1909 by the artist)
Oil on canvas
68 3/4 x 45 1/4 in. (174.7 x 114.7 cm)
The Museum of Modern Art, New York (Hillman Periodicals Funds)
Fig. 3

*Compenetrazione iridescente (Iridescent Interpenetration)*, 1912

Pencil and watercolor on paper (from the Düsseldorf sketchbooks)

7 x 7 1/2 in. (17.7 x 18.8 cm)

Galleria Civica d'Arte Moderna e Contemporanea, Turin
Fig. 4
La Fiera di Parigi (Luna Park) (Paris Fair [Luna Park in Paris]), 1900
Oil on canvas
26 x 34 in. (65 x 81 cm)
Civico Museo d’Arte Contemporanea, Milan
Fig. 5
*Orbite celesti (Celestial Orbits)*, 1913
Oil on canvas
23 5/8 x 31 1/2 in. (60 x 80 cm)
Private collection
Fig. 6
Title page of *L’Illustrazione Italiana* 37, no. 21 (May 22, 1910).
Fig. 7
Photograph showing Alexander Graham Bell (1847-1922) opening the long-distance telephone line with Chicago on October 18, 1892, reproduced in *Emporium* 2, no. 9 (September 1895): 219.
Switchboard used in long-distance telecommunication, reproduced in *Emporium* 2, no. 9 (September 1895): 215.
A man’s portrait executed using current telegraphic technology, reproduced in *Emporium* 1, no. 1 (January 1895): 80.
Fig. 10
View of electric light fixtures installed at the 1884 *Esposizione Internazionale di Elettricità* (International exhibition of electricity) in Turin.
Illustration by Carlo Chessa
ESPOSIZIONI

LE ESPOSIZIONI D’ELETTRICITÀ E DELL’INDUSTRIA SERICA A COMO.

Eccoli la reggia del Lario, la petrificata città di piccanza latta aggettata in quest’attimo, per la sua alta e folle densità insidiosa, al piano e traba e non d’Italia sola!

Eccoli la città di provincia assai lungimirante, condotti a formare, certo non per grazia di moto salubre alle più sciocche passaggini di cui vanno celebrati le città dell’Italia fiamminga! Il suo nuovo e迅猛如雷 Hide Lina! qui orto frutteto, il cui da poco ben noto il pittoresco paesaggio è intenso: una sorta di rete di filo d’oro e d’argento; la cortesia cittadina allo scudetto a coronamento, compiuto: ancora una volta, non solo, ma con decoro e bellezza del genere del Arte! Eccoli la quale città di provincia con sui dolci collini, che uno le scorza dal parroco stimo dell’artista e per radici col suo lago, dove sedizioni ed incantati; sì scintillano miniere, più oltre, sulle orme del suo antico fortificato; coltri un vasto toro, non più alto però dei moderni volati; ingannando ogni giorno più omenosa nel panorama celeste a testimoniare delle industrie e del commercio ogni giorno più fiorito!

Eccoli Cosmali qui riprodotta nei portici leoni dell’Emporium. L’aspetto ha più scintile e gli stomaco, quando l’ora e l’ora, dal canto degli artisti e dintorni, con le solitarie fiere di una roccia dalla cima, P. R. e P. di L. G. dell’Esposizione Venticinquesima, nella “Sala del Lario” e un disegno e mosaici in carta dei
Fig. 12
Fig. 13
View of the electric train installed at the 1900 Exposition Universelle in Paris published at bottom right in Emporium 12, no. 69 (September 1900): 246.
Fig. 14
Photograph by Neurdein Frères
Bibliothèque nationale de France, Department of Prints and Photography, QB-1 [1900/3]-FOL
Fig. 15

The Palais de l’Electricité and the Château d’Eau (Champ de Mars) at the 1900 Exposition Universelle, Paris, 1900

Patented by s.g.d.g.; published in Paris by Kann Frères & Zabern

Die-cut color lithograph (undivided back)

The Leonard A. Lauder Postcard Archive, promised gift to the Museum of Fine Arts, Boston
Fig. 16
Theodor-Josef Hoffbauer
The 1900 Exposition Universelle, Paris: the Palais de l’Electricité and the Château d’Eau, 1900
Hand-colored lithograph, with mica chips and stamped tinfoil
Private collection
Fig. 17
Fig. 18
Giacomo Balla
*Il Circo forain (sic) (The Fair's Circus)*, ca. 1900
Oil on canvas
Dimensions and whereabouts unknown
Fig. 19
Louis Hayet
*Fête foraine la nuit, la parade (Fair at Night, the Sideshow)*, 1888
Oil on canvas
28 3/4 × 36 1/4 in. (73 × 92 cm)
Association des Amis du Petit Palais, Geneva
Fig. 20
Georges Seurat
Parque de cirque (Circus Sideshow), 1887-88
Oil on canvas
39 1/4 x 59 in. (99.7 x 149.9 cm)
Metropolitan Museum of Art, New York; Bequest of Stephen C. Clark, 1960
Fig. 21
A view of the Château d’Eau at the 1900 Exposition Universelle in Paris published at top right in Emporium 12, no. 69 (September 1900): 247.
Fig. 22
“TOUT PARIS - 1372 / Place de la Nation / La Foire aux Pains d’Epices (XIᵉ et XIIᵉ arr.),”
(View of the Gingerbread Fair at the Place de la Nation in Paris), stamped 1908
Published by F.F.–F. Fleury, Paris
Photolithograph
Fig. 23
“TOUT PARIS — 1375 - Place de la Nation / Foire aux Pains d’Epices (XIᵉ et XIIᵉ arr.),”
(View of the Gingerbread Fair at the Place de la Nation in Paris), ca. 1908
Published by F.F.–F. Fleury, Paris
Photolithograph
Fig. 24
“683. Montagnes russes circulaires / C. Maury. [inscribed ‘(Fête de Neuilly-s/-Seine)]’,” (View of a circular roller coaster during the day at a fairground in Neuilly-sur-Seine), first decade of the twentieth century
Published by Photo-Phono
Photolithograph
Musée des Civilisations de l'Europe et de la Méditerranée, Marseille; Fonds Soury, inv. no. Sou.2.74.1
Fig. 25
“801. Un tour à la Fête la nuit / Les Montagnes russes circulaires [inscribed ‘Maury’],” (View of a Parisian fairground at night with a circular roller coaster at center), around 1908
Published by Gondry
Photolithograph
Musée des Civilisations de l'Europe et de la Méditerranée, Marseille; Fonds Soury, inv. no. Sou.2.75.1
Fig. 26
Pablo Picasso
_Le Moulin de la Galette, 1900_
Oil on canvas
34 3/4 x 45 1/2 in. (88.2 x 115.5 cm)
Solomon R. Guggenheim Museum, New York, Thannhauser Collection; Gift of Justin K. Thannhauser
Fig. 27
Joseph Stella
*Luna Park*, ca. 1913
Oil on canvas
17 1/2 x 23 1/2 in. (44.5 x 59.7 cm)
Whitney Museum of American Art, New York; Gift of Mrs. Charles A. Goldberg
Fig. 28
Joseph Stella
*Battle of Lights, Coney Island, Mardi Gras*, 1913-14
Oil on canvas
77 x 84 3/4 in. (195.6 x 215.3 cm)
Yale University Art Gallery, New Haven; Gift of Collection Société Anonyme
Fig. 29
Umberto Boccioni
*Rissa in galleria (Riot in the Gallery), 1910*
Oil on canvas
29 15/16 x 25 3/16 in. (74 x 64 cm)
Pinacoteca di Brera, Milan
Fig. 30
*Villa Borghese–Parco dei daini (Villa Borghese)*, 1910
Oil on canvas (consisting of fifteen panels)
74 3/4 x 153 1/4 in. (190 x 390 cm)
Galleria Nazionale d’Arte Moderna, Rome

Fig. 31
Detail of *Villa Borghese–Parco dei daini (Villa Borghese)*, 1910
Galleria Nazionale d’Arte Moderna, Rome
Fig. 32
*Salutando* (*Gli addii scala* (*Saying Goodbye [The Stairwell of Farewells]*)), 1909-10
Oil on canvas
40 3/4 x 41 in. (103.5 x 104.1 cm)
Formerly in the Lydia and Harry Lewis Winston Collection (Dr. and Mrs. Barnett Malbin)
Fig. 33
Photographer unknown.
Fig. 34
*Lampada ad arco*-studio (Study for *Street Light*), ca. 1911
Pencil on graph paper
(10.3 x 8 cm)
Private collection, Rome
Fig. 35
A view across the street from where Balla rendered one of the studies for *Lampada ad arco* (Street Light) at via delle Tre Cannelle in Rome in 2016. Photographer unknown. Source: Google Maps
Fig. 36
Italian poster advertisement promoting the use of Nitens incandescent light bulbs.
Fig. 37
Fig. 38
*Lampada ad arco* (Drawing for *Street Light*), ca. 1911
Pencil on paper
5 5/8 x 11 1/4 in. (14.3 x 28.6 cm)
The Museum of Modern Art, New York, Christopher Tietze Fund
Fig. 39
Studio per *Compenetrazione iridescente n. 2* (Study for *Iridescent Interpenetration No. 2*), 1912
Pencil and watercolor on paper
8 11/16 x 6 15/16 in. (22 x 17.7 cm)
Galleria Civica d'Arte Moderna e Contemporanea, Turin
Fig. 40
*Compenetrazione iridescente n. 7 (Iridescent Interpenetration No. 7)*, 1912
Oil on canvas, with the artist’s original frame
32 15/16 x 32 15/16 in. (83 x 83 cm)
Galleria Civica d'Arte Moderna e Contemporanea, Turin
Fig. 41
Studio per Compenetrazione iridescente (Study for Iridescent Interpenetration), ca. 1913
Pencil and watercolor on paper
9 1/4 x 7 1/4 in. (24 x 18.5 cm)
Galleria Civica d'Arte Moderna e Contemporanea, Turin
Fig. 42
Spectra of various stars reproduced in Angelo Secchi. *Le stelle; Saggio di astronomia siderale.* Milan: Fratelli Dumolard, 1877, pl. III.
Fig. 43
*Compenetrazione iridescente (Iridescent Interpenetration)*, ca. 1913
Mixed media on paper pasted on canvas
19 3/4 x 9 3/4 in. (50 x 25 cm)
Turske & Turske, Zürich
Il collocamento esatto di questi pezzi si ottiene facilmente di giorno usando il Sole. Così le osservazioni sono facili e le stelle non possono equivocarsi. Soltanto resta l'inconveniente che questi pezzi addizionali esigono la giunta di nuovi contrappesi alla meccanica, onde non possono montarsi e smontarsi con tanta facilità come si vorrebbe.

Però, benché si eccelletto, questo strumento è molto costoso, e non era sperabile che venisse molto diffuso, ed essendo non molto comodo per la ricerca ordinaria, abbiamo cercato un mezzo molto più semplice ed economico, e siamo riusciti ad ottenere uno spettroscopio che raccogliendo interamente la luce delle stelle permette di esaminarne fino talune di nona grandezza.

Questo strumento è semplicissimo, ed è disegnato in sezione, nella fig. 15. Esso consiste in un prisma a visione diretta $P, Q, P', Q'$, $P''$ dietro il quale è una lente cilindrica $C$ collasso perpendicolare al piano di dispersione.
Fig. 45
Giacomo Balla in his studio at via Parioli (present-day via Paisiello), Rome, around 1908. The painter’s *La Costellazione di Orione* (*The Orion Constellation*) of probably late 1907 installed on the wall next to *Il mendicante* (*The Beggar*, 1902) at far left. Photographer unknown.
Fig. 46
Sketch for La Costellazione di Orione (The Orion Constellation), ca. late 1907
Oil on cardboard
39 x 27 1/8 in. (99 x 69.2 cm)
Private Collection, Rome
Fig. 47
Black-and-white photographs of the Orion constellation (at bottom right) and nebulae published in *Emporium* 26, no. 155 (November 1907): 391.
Fig. 48
*Tutto si muove (Everything Moves)*, 1913-1914
Tempera on sketch paper
28 3/4 x 33 1/2 in. (73 x 85 cm)
Private collection
Fig. 49
Fig. 50
Observations of Venus rendered by Armando de Paolis and reproduced *L’Astronomie; Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe*, vol. 22 (1908): 474, fig. 200.
Fig. 51

Fig. 52
Cinematographic views of an Aurora Borealis taken on April 8, 1913, during an expedition studying this natural phenomenon and published in *L’Astronomie: Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe*, vol. 27 (November 1913): 493.
Fig. 53
*Mercurio che passa davanti al sole (Mercury Passing in front of the Sun)*, 1914
Pencil on paper
6 3/4 x 4 3/4 in. (17 x 12 cm)
Private collection
Fig. 54
Mercurio che passa davanti al sole n. 2 (Mercury Passing in front of the Sun, Nr. 2), 1914
Pencil on paper
14 3/8 x 11 1/2 in. (36.5 x 29 cm)
Private collection, Lugano
Fig. 55
Mercurio passa davanti al sole (Mercury Passing in front of the Sun), 1914
Ink on paper
11 x 7 1/2 in. (27 x 19.4 cm)
Private collection (Courtesy Galleria Arte Centro, Milan and Sperone Westwater, New York)
Fig. 56
*Mercurio che passa davanti al sole (Mercury Passing in front of the Sun)*, 1914
Pastel on paper
9 3/4 x 7 1/16 in. (24.7 x 18.2 cm)
Private collection, Milan
Fig. 57
Mercurio che passa davanti al sole (Mercury Passing in front of the Sun), 1914
Tempera and mixed media on paper
25 3/8 x 19 3/4 in. (64.5 x 50.5 cm)
Private collection (formerly in the Slifka Collection, New York)
Fig. 58
*Mercurio che passa davanti al sole (Mercury Passing in front of the Sun)*, 1914
Tempera on paper
9 1/2 x 7 1/16 in. (24 x 18 cm)
Private collection, Rome
Fig. 59
*Mercurio che passa davanti al sole (Mercury Passing in front of the Sun)*, 1914
Tempera on paper
9 1/2 x 7 1/16 in. (24 x 18 cm)
Private collection
Fig. 60
*Mercurio che passa davanti al sole (Mercury Passing in front of the Sun)*, 1914
Pencil and gouache on paper
16 1/2 x 11 3/4 in. (42.1 x 30 cm)
Museum of Modern Art, New York (Bequests of Helen Acheson, and Eve Clendenin, gift of A.E. Gallatin [by exchange] and gift of Constance B. Cartwright)
Fig. 61
Mercurio che passa davanti al sole (Mercury Passing in front of the Sun), 1914
Tempera on paper
17 5/8 x 17 3/4 in. (45 x 35.7 cm)
Private collection
Fig. 62
Il pianeta Mercurio passa davanti al sole (Planet Mercury Passing in front of the Sun), 1914
Oil on waffle paper
24 x 19 3/4 in. (61 x 50.5 cm)
Musée national d’Art Moderne, Centre Georges Pompidou, Paris
Fig. 63
Mercurio che passa davanti al sole visto dal telescopio (Mercury Passing in front of the Sun, Seen through a Telescope), 1914
Gouache on paper
32 x 24 in. (81 x 61 cm)
Formerly in the collection of A. Alfred Taubman
Fig. 64
Mercurio passa davanti al sole visto nel cannocchiale (Mercury Transits the Sun, Seen through a Telescope), 1914
Tempera on paper with canvas
54 2/8 x 39 in. (138 x 99 cm)
Museum Moderne Kunst Stiftung Ludwig, Vienna
Fig. 65
Studio per *Mercurio che passa davanti al sole* (Study for *Mercury Passing Before the Sun*), 1914
Tempera on paper
25 3/4 x 19 3/4 in. (65 x 50 cm)
Formerly in the Lydia and Harry Lewis Winston Collection (Dr. and Mrs. Barnett Malbin)
Fig. 66
Pierre-César Jules Janssen
Transit of Venus, 1874
Daguerreotype, full plate
Société française de photographie, Paris
Fig. 67
Scientific drawing showing the variously magnified diameter of planet Mercury in relation to the sun’s disk published in L’Astronomie: Bulletin de la Société astronomique de France et revue mensuelle d’astronomie, de météorologie et de physique du globe, vol. 21 (1907): 541, fig. 256.
Fig. 68
ECLIPSES

shadow, and she can only be eclipsed when she penetrates into this shadow.

We can very easily understand the production of eclipses by an examination of this figure. The sun is represented at the top of the drawing. We see in the lower part the earth, accompanied by the moon. The latter revolves, as we have seen, round the earth. When it passes, at the moment of full moon (the lower part of its orbit), through the shadow of our globe, she no longer receives the light of the sun: this is an eclipse of the moon, total or partial according as our satellite is totally or partially immersed in our shadow. On each side of the complete shadow there is a penumbra (which will be explained by following the dotted lines), due to the fact that a part only of the solar light penetrates into this region. A second penumbra, very thin, is produced by the atmosphere which surrounds our globe.

On the other hand, when at the moment of new moon our satellite passes exactly before the sun, its shadow falls on us, and produces on the surface of our globe a little circle which travels over different countries, following the motion of rotation of the earth. All the countries over which this shadow passes have the sun hidden during a certain time; this is an eclipse of the sun—total if the moon is sufficiently near us for its apparent diameter to exceed that of the sun, annular if it is then in the most distant region of its orbit and is smaller than the solar disc, partial if the centres of the moon and the sun do not coincide, and if the moon only hides the sun on one side.

Such is the general theory of eclipses. We will now examine the details of the phenomenon, and we will commence with Eclipses of the Moon.

Eclipses of the Moon

Although the moon is very small compared with the sun, it subtends pretty nearly the

Fig. 69