Winging It: Human Flight in the Long Eighteenth Century

Dissertation

Presented in Partial Fulfillment of the Requirements for the Degree

Doctor of Philosophy

in the Graduate School of The Ohio State University

By

Jared Jones, M.A.

Graduate Program in English

The Ohio State University

2019

Dissertation Committee

Roxann Wheeler, Advisor

David Brewer

Sandra Macpherson

Jacob Risinger

Abstract

Although the first balloon flights in 1783 created a sensation throughout Europe, human flight had long captured the imaginations of scientific and literary authors alike. Prior histories of flight begin with balloons, but earlier centuries boasted a strange and colorful aviary that shaped thinking about flight long before the first balloon ever left the ground. Taking a cultural materialist approach informed by a broad familiarity with the development of early flight machines and a deep familiarity with the literary conventions of the period, I analyze historical materials ranging from aeronautical treatises to stage pantomimes, from newspaper advertisements to philosophical poems, from mechanical diagrams to satirical cartoons. This earlier culture possessed high hopes and anxieties about human flight. I argue that early flight was lively and varied before the invention of a successful flying machine, and that these early flights were important because they established an aerial tradition astonishingly resistant to change. Rather than revolutionizing the culture, ballooning was quickly incorporated into it. Although ballooning came to be regarded as a failure by many onlookers, the aerial tradition had long become accustomed to failure and continued unabated. Human flight has always promised tremendous and yet debatable utility, a paradox that continues into the present age.

Dedication

To my friends,

who are my family, and

to my family,

who are my friends.

Acknowledgments

This dissertation is the culmination not only of a research project but of the past decade of my life. I treasure the people and places that have helped me to write my story as well as the story of early human flight. If you, reader, have accompanied me on some part of this journey, then I am profoundly grateful.

Thank you to the people and the institutions that supported me through my research. This work was supported by grants from the Ohio State University and from the American Society for Eighteenth-Century Studies as well as a month-long fellowship at the William Andrews Clark Memorial Library. Thank you, Dr. Tom Crouch, for your mentorship amidst chaos, and thank you to the National Air and Space Museum for hosting me for ten golden months. Your resources and guidance made my project richer and deeper than it ever could have been without you.

Thank you to my teachers. You helped me to develop not only the dissertation itself but also the powers I needed to write it. Dr. Roxann Wheeler, thank you for supporting my pursuit of the strange. Dr. David Brewer, thank you for introducing me to how strange the eighteenth century could be. Dr. Sandra Macpherson, thank you for showing me what to take seriously and what to laugh at. Dr. Jacob Risinger, thank you for representing the Romanticism that makes my long eighteenth century very long indeed. Thank you, Dr. Amanpal Garcha and Kathleen

Griffin, for always supporting the students who needed you. Thank you, Dr. Adam Komisaruk, for getting me mixed up with all of this in the first place. Thank you, Dr. Deborah Janson, for expanding my horizons. Thank you, Dr. Cynthia Chalupa, for believing in me. I will always remember what you taught me.

Thank you to my family. Thank you, my parents and grandparents, who always supported my pursuit of education. Thank you, Austin Diamond-Jones and Nora Diamond-Jones, for your warmth and hospitality. Thank you, Cheryl Honeycutt and BJ Honeycutt, for your boundless enthusiasm. Thank you, Keats, Ro, and Ruka, for keeping me company through the long days and nights working at my computer. Thank you, Zane Jones, for the great gift of endless laughter.

Thank you to my friends. Dr. Krupal Amin, Dr. Vinal Lakhani, Dr. Sanja Kadric, Toni Calbert, Dr. Michelle Cohen, Dr. Matthew Connolly, Moriah Keith, Dr. Brittany Warman, and Michael Bahl—you made the work worth doing. I could not have asked for better colleagues and companions. I have special gratitude for my writing group, Dr. Erin Bahl and Andrew Sydlik, whose uplifting counsel helped me to get my inchoate project off the ground. Through travels and travails, my friends have meant the world to me.

You have all been my wind, my wings, and my open sky. My highest thanks go to my steadfast star, Dr. Sara Cleto. From my first day of graduate school to the last, you have flown every mile with me, and I cherish your brilliant light.

Vita

2008–12 ..... B.A. World Lang., Lit., and Linguistics, West Virginia University

2008–12 ..... B.A. English, West Virginia University

2012–13 ..... University Fellow, The Ohio State University

2012–14 ..... M.A. English, The Ohio State University

2013–18 ..... Graduate Teaching Associate, The Ohio State University

2018 ..... Predoctoral Fellowship, William Andrews Clark Memorial Library

2018–2019 ..... Guggenheim Fellowship, National Air and Space Museum

Fields of Study

Major Field: English

History of Science

Table of Contents

Abstract ii
Dedication iii
Acknowledgments iv
Vita vi
List of Figures ix
List of Illustrations x
Introduction 1
Prehistory to Balloonomania 8
As the Balloon Flies 13
Technologies Real and Imagined 28
Chapter 1. Vastness of the Sky: Understanding Early Flight Narratives 31
Multitude of Flights 33
A New Taxonomy of Early Flight Narratives 39
Fifty Plots Plotted on the Plane of Dianoia and Realism 44
Axis of Dianoia 64
Axis of Realism 71
Four Major Types of Flight Narratives 82
Chapter 2. Mocking Icarus: Antiaerial Sentiment in Science and Satire 91
Antiaerial Sentiment 96
Four Reasons to Doubt 107
Coxcomb *Virtuoso* 116
The *Emperor* Has No Wings 128
Rehabilitating Satire on the Royal Society 138
Gulliver's Flight of Fancy 144
Antiaerial Sentiment and the Balloon 150
Chapter 3. Performing Flight: Wings on Balloons and in the Theater 157

Uneven Diffusion of Knowledge 169
Ambiguous Course of Progress 183
Theater in the Flight 197
Flight in the Theater 220
Chapter 4. Cosmoscope: Visions from a Distant Star 242
Menippean Satire and the Cosmoscope 245
Sightseeing in Fairyland 250
Mab's Cosmoscope 266
Mythic Science 278
Cosmic Daemons 288
Bibliography 301

List of Figures

Figure 1 Map of Fifty Early Flight Narratives 46
Figure 2 Axis of Dianoia 66
Figure 3 Axis of Realism 74
Figure 4 Four Major Types of Flight Narratives 83

List of Illustrations

Illustration 1 “The Perilous Situation of Major Money” (c. 1785) 49
Illustration 2 “A View from the Balloon at its Greatest Elevation” (1786) 53
Illustration 3 “A Balloon Prospect from Above the Clouds” (1786) 54
Illustration 4 “The Balloon over Helsbye Hill in Cheshire” (1786) 58
Illustration 5 “Aeronautics” (1818) 160
Illustration 6 Lana's Flying Ship shown in Prodromo (1670) 168
Illustration 7 “Illustration de la Barque inventée en 1709 par Laurent de Gusman Chapelain du Roi de Portugal pour s'élever et se diriger dans les Airs." [“Illustration of the Boat invented in 1709 by Laurent de Gusman, Chaplain of the King of Portugal, to rise and navigate in the air"] (1786) 168
Illustration 8 Leonardo’s Flying Machine, Codex Atlanticus (c. 1480, 860r) 173
Illustration 9 Burattini's Flying Dragon (c. 1648) 173
Illustration 10 Domingo Gonsales's Flight by Gansas, Man in the Moone (1657 edition) 174
Illustration 11 Bottles of Dew, Σεληναρχια (1659 English translation of Godwin’s L’autre monde) 175
Illustration 12 Swedenborg machine, static model (1961) 178
Illustration 13 Morris's Flying Saucer (1751) 179
Illustration 14 Satirical Flying Saucer (1769) 179
Illustration 15 Die Flugzeughandschrift des Melchior Bauer [The Flight Manuscript of Melchior Bauer] (8) (1764) 182
Illustration 16 Besnier’s Flying Machine (1678) 187
Illustration 17 Aerial Battle between the Ancients and the Moderns (1751) 188
Illustration 18 Winged Woman (1751) 191
Illustration 19 Peter and His Children Observe the Flying Islanders (1783) 192
Illustration 20 "Mécanique du Vaisseau-Volant." [“Mechanics of the Flying Ship.”] (1782) 195

Illustration 21 “Descente de Blanchard” [Blanchard’s Descent”] (1784) 196
Illustration 22 Tissandier balloon chair (1800s) 198
Illustration 23 Sévres Bisque Porcelain Plaque (c. 1788) 198
Illustration 24 Silk Fan Decorated with Balloons and Pegasus (c. 1783) 200
Illustration 25 Plate X (late 1700s) 202
Illustration 26 "Principal Characters in the New Pantomime called Harlequin Gulliver, or the Flying Island." (1818) 210
Illustration 27 “Figure exacte et proportions, du globe aérostatique” [“Exact Illustration and Proportions of the Aerostatic Globe”] (1786) 211
Illustration 28 Morning Post and Daily Advertiser, 6 Feb. 1784 215
Illustration 29 “The New Mail Carriers, or Montgolfier and Katterfelto taking an airing in balloons” (1783) 219
Illustration 30 Parallel Ads for Harlequin and Lunardi (1784) 230
Illustration 31 “A Representation Of Mr. Lunardi's Balloon, As Exhibited In The Pantheon” (1784) 231
Illustration 32 Ceramic Plates (1800s) 239
Illustration 33 La Découverte australe [The Discovery of Australia] (1781) 241

Introduction

No bird soars too high, if he soars with his own wings.

—William Blake, *The Marriage of Heaven and Hell*

At first glance, human flight in the long eighteenth century seems more hot air than hot air balloon. Figurative or literal, the myth of Icarus offered a moral that could hardly be called ambiguous, and centuries of winged flying machines had ended in disaster. Recent scholarship has drawn attention to the popular balloonomania craze that astounded Europe with the first successful flights of 1783, but the long eighteenth has a longer, richer story to offer the study of human flight. Prior to 1783, flight was a tantalizing power long imagined but stubbornly beyond human reach. Before, during, and after balloonomania, aeronautics embodied ambition on the edge of the natural order, high-flying but liable to fall. Although balloons quickly became a popular public spectacle, ballooning did not thereafter become a fixture of military operation, global exploration, or domestic travel as some optimistically anticipated. The literature of human flight has always flown faster than its practical development, and the breakthroughs that made lighter-than-air transportation possible were deeply embedded within a culture that had its own firm beliefs about the eventual means and meaning of human flight.

By analyzing the long scientific and literary history of aerial projects imagined before the invention of ballooning, I will discover what it meant to Britons for characters to occupy the sky in Restoration and eighteenth-century England. Ancient assumptions about human flight, particularly its sinister associations in folklore and the recurring insistence on humans with animal-like wings, molded inquiry into the subject not only before the invention of ballooning but also continued to shape aeronautical thinking long after one might expect them to have been dismissed as failed assumptions. Even while mechanical advances were being rapidly made on other fronts, a winged flying machine remained a tantalizing fantasy. Only novel chemical research made the lighter-than-air flight possible, a complete repudiation of the futilely flapping wings of tradition. In spite of wings' continued failure to produce human flight, however, the many traditional beliefs and enduring expectations surrounding flight were far from grounded. As the varied literary materials of the following chapters show, popular ideas about flight, even among the learned, embraced a complex mixture of sources. The paradoxes of ballooning are an ideal subject for exploring the intellectual movements of a rapidly changing scientific culture.

While these early expectations might be expected to dissipate in the wake of 1783, the imaginative and scientific literature circulating before and after the invention of ballooning reveals a culture often unable or unwilling to give up its prior assumptions about human flight. Throughout the eighteenth century, revolutionary changes in science and technology altered but did not displace accepted wisdom. Novels, plays, and other literary works engage variously with the

history of science. Demoniacal associations cling to air travel even as witches' brooms become wayward balloons. For many onlookers, balloons seemed a freakish spectacle; no animal in nature flew without wings, and so, commonsense dictated, any flying vehicle would remain fickle and dangerous until additional wings were perfected. Unnatural or not, the balloon brought the marvels of the experimental demonstration into the realm of mass spectacle, and, in the eyes of the admiring crowds, the wonder of real human flight remained a close cousin of the far older aerial wonders of imaginative literature and the stage. Nature abhors a clean break. A century earlier, political revolutions in 1660 and 1688 embodied a contradictory mixture of innovation and tradition that likewise marked the simultaneous establishment of the Royal Society and the hybrid character of early human flight.

Even as new generations of natural philosophers took up the problem of flight, their work allowed the older literature of flight to resonate in new ways, much as the astronomical discoveries of the early seventeenth century had cast new light on the lunar travels imagined in Lucian's *True History* (ca. 100 CE). Eighteenth-century writers commonly address the folly and wonder of human flight, and new stories of human flight, real or imagined, came into existence inside a tempest of scientific and cultural influences old and new. Literary and scientific holdovers from the Restoration and eighteenth-century shape the discourse of human flight even through the Romantic era in strange ways; this complexity falls out of sight, however, if 1783 becomes an isolated scholarly date, both the beginning and the end of ballooning, a single historical footnote marching towards the technological

triumphs and terrors of the twentieth century. To escape this reductionism, early human flight must be considered as a slower, multithreaded phenomenon.

In this dissertation, I consider the many forms of flight that existed in the long eighteenth century. Recent scholarship on this subject has confined itself to flight as represented by the *globe aérostatique* [aerostatic globe or aerostat], a class of related aerial craft based around a large balloon filled with buoyant gas.[1] The brothers Joseph-Michel and Jacques-Étienne Montgolfier pioneered the hot air balloon (also called *Montgolfière* or fire balloon), and Jacques Charles developed the hydrogen balloon (also called a *Charlière* or a gas balloon) immediately thereafter. Among the non-flying public, however, the distinction between the two types of balloon was commonly disregarded as were, I aim to show, many other differences between balloons and flying machines as traditionally imagined. Human flight in the long eighteenth century includes not only balloons but also flight by the aid of spirits, birds, rockets, magnets, and other wonderful machinery. Though revolutionary, balloons could not escape the prevailing currents of culture, and

[1] Because the word *balloon* referred to an inflated bladder or other variety of enlarged ball long before 1783, *aerostat* would be a more technically precise and unambiguous term. I have, however, followed the practice of most other scholars on this subject and preferred the more familiar term throughout. Both terms were in use throughout the late eighteenth century, with balloon frequently but not regularly appearing as *air balloon*. For an exhaustive study of the relevant terminology, see Svante Stubelius's *Balloon, Flying-Machine, Helicopter: Further Studies in the History of Terms for Aircraft in English* (1960). Many technical labels familiar today, such as *dirigible*, carried less specialized meanings in the eighteenth century than they gained in the nineteenth century or especially in the twentieth century.

eighteenth-century authors employed age-old aerial motifs to debate the value and danger of a new technology.

For the main objects of my study, I have focused on works widely known in English popular and scientific culture. These works were usually but not always published in the English language; I also examine some important cases of human flight in other European literatures, most frequently French and Latin but also Greek, Italian, Portuguese, and Swedish. The German language is conspicuously absent from the body of familiar, early flight narratives. Goethe's *Faust* (1808/1832) was a late addition to early human flight; its later canonization as a work of world literature extends beyond the historical bounds of this project. Although based on a real-life German and today relatively forgotten in English-speaking popular culture, *Baron Munchausen's Narrative of His Marvellous Travels and Campaigns in Russia* (1785) was in fact first an English text written anonymously by Rudolf Erich Raspe, a colorful Hanoverian rogue living in exile in England to escape prosecution for frauds committed on the Continent. The book was later expanded and altered by publishers and translators, and the public question of its authorship became ever murkier. Raspe himself was a disgraced former fellow of the Royal Society, and the international connections of the period both explain the development of a shared culture of flight as well as English's outsized role in the European imagining of flight.

English and French boast the most widely known new writing about flight in the period. Latin's traditional prominence as a scholarly language had waned significantly by the late seventeenth-century. The London Royal Society (founded 1660) and the *Académie des sciences* (founded 1666) raised the international

profiles of their respective national languages as scientific publications were increasingly written in and even distributed abroad in vernacular languages. In writing about flight, English took an early lead, and later authors throughout Europe most commonly alluded to existing English examples, such as Francis Godwin's *The Man in the Moone* (1638) and John Wilkins's *Mathematicall Magick* (1648). For example, Cyrano de Bergerac's *L'autre monde* (1656) has its moon-visiting protagonist meet Godwin's protagonist, a fellow traveler among the stars, and so Cyrano's success drew additional attention to Godwin's already popular story.[2] Godwin's story was not only frequently republished in English but was translated and published multiple times in other European languages, especially French, Dutch, and German. As for Wilkins, more than a century later, the author remained sufficiently famous abroad to be the fictionalized, spacefaring protagonist of a series of fantastical engravings in Italy, which I discuss briefly in Chapter 2. Today in Munich at the German Museum of Masterpieces of Science and Technology (commonly called the *Deutsches Museum*), the largest of its kind in the world, the

[2] The naming of Cyrano's text is problematic. His *Histoire comique ou Voyage dans la Lune* was published in 1650 and received the more familiar title *Histoire comique des Estats et Empires de la Lune* in 1656, a year after the author's mysterious death. A sequel, *Histoire comique des États et Empires du Soleil*, followed in 1662. The first English translation was *Σεληναρχια, or, The Government of the World in the Moon: A Comical History* (1659), while another translation used the more literal title *The Comical History of the States and Empires of the Worlds of the Moon and Sun* (1687). Still another English title followed: *A Voyage to the Moon, with Some Account of the Solar World* (1754). Although frequently seen today, the title *L'autre monde* seems not to have been used at all until the nineteenth century, and even today the title remains unstandardized in both English and French. Throughout these chapters, I have preferred *L'autre monde* as the simplest common title with the least potential for confusion with similarly named texts mentioned elsewhere in this dissertation.

Historische Luftfahrt [Historical Aviation] exhibition closely resembles the Early Flight exhibition at the National Air and Space Museum in Washington, DC. In both museums and elsewhere in the world, Godwin's fiction, with its memorable imagery of harnessed geese drawing a man to the moon, prominently represents the early history of flight even in a space dedicated to real science and technology. Although the first successful flying machine was invented in France in the late eighteenth century, British authors established an early authority on the subject, and their works were translated and circulated in Europe to a unique degree.[3]

For the main objects of my study, I have chosen works with relatively long lives in English popular culture and contextualized these works with other texts and events that clarify their diachronic significance throughout the eighteenth century. Flight repeatedly animates some of the eighteenth century's most influential scientific and literary texts, and Chapter 1 examines how these interconnected texts form a vast network of flight literature, a network that thrived in some literary forms (satire) and starved in others (the sentimental novel). Chapter 2 focuses on a small but influential section (antiaerial writing) of this network to demonstrate how influential early thinking about flight remained throughout the century. Chapter 3 reconsiders the invention of the flying machine as a part of the wing-oriented

[3] Before Edgar Allan Poe's "The Balloon-Hoax" (1844), the nascent American publishing industry did not contribute significantly to the early literature of flight with one exception. In Connecticut, Daniel Moore produced a chiliastic reworking of Cyrano's *L'autre monde* shortly after the invention of ballooning, and, in Chapter 4, I discuss Moore's utopian story, *Passage to the Moon, in a Flying Machine, called An Air Balloon* (1785). Daniel Moore is unrelated to the much earlier Thomas More who wrote *Utopia* (1516).

traditions that surrounded human flight. Finally, in Chapter 4, I argue that, even in the late eighteenth and early nineteenth centuries, after the invention of ballooning, flight continued to look and function much as it had in the cosmic voyage literature of a century prior. Perceptions of flight evolve erratically over time, and competing attitudes and hypotheses coexist and mingle across philosophical arguments, stage entertainments, and innumerable other artistic and intellectual performance venues. Popular works took on new relevance over time, shaping how subsequent authors and audiences imagined human flight. Today as in the eighteenth century, most readers do not work on the edge of scientific exploration. Instead, they play there, simultaneously grounded in reality and soaring through the unknown.

Prehistory to Balloonomania

The most immediate audience for my research is scholars of balloonomania, the wave of balloon enthusiasm that swept through Europe in the 1780s. My approach differs from previous work because I take a long view of balloonomania rather than considering it as an isolated fad. Human flight has long been a subject of scientific interest but has only recently begun to achieve prominence within science studies. Although balloons ultimately produced few practical applications, early aeronauts did find an appropriate success in studying the atmosphere itself. Increasingly precise and portable instruments measured air pressure and composition at previously inaccessible heights. Balloons proved an ideal vantage point to study the atmosphere, and significant recent scholarly work celebrates ballooning not only as an important scientific achievement but also as a valuable site for cultural analysis. In his 2015 article on 1780s balloonomania, John Robbins

writes that "whereas [eighteenth-century] scientists and writers found much to gain from one another, modern culture tends to view science as a pure contributor to knowledge production with nothing to gain from humanistic learning in return" (535). Robbins argues instead that aeronauts presented their experiments as theatrical spectacles. Like other scholars studying balloonomania, however, Robbins invokes a conventional date-of-invention paradigm that does not consider the long, chaotic prehistory of human flight.[4]

I take balloonomania as part of a larger, longer flight process, while previous scholarship conventionally examines balloonomania as a fad and as an isolated point in the history of flight technology. I review particular movements of ballooning scholarship in greater detail in the introductions of my individual chapters, but the interest in balloons is rising. Since I started my research for this project, several new works of scholarship have been published on this subject, including Jason Pearl's "A View from Above: Satiric Distance and the Advent of Ballooning in Britain" (2018), Arden Hegele's "Romantic Balloons: Toward a Formalist Technology of Poetics" (2017), and Clare Brant's *Balloon Madness: Flights of Imagination in Britain, 1783–1786* (2017). As a major extensive scholarship of ballooning develops, however, its short focus has become more apparent. For

[4] Exceptions to this rule generally date to the early decades of the airplane, and my research is broadly indebted to Marjorie Nicolson's essential survey of early modern cosmic voyage literature, Marjorie Nicolson's *Voyages to the Moon* (1948). From the same period, see also Jules Duhem's *Histoire des idées aéronautiques avant Montgolfier* [*History of Aeronautical Ideas Before Montgolfier*] (1943) and Jules Duhem's *Musée aéronautique avant Montgolfier* [*Museum of Aeronautics Before Montgolfier*] (1944).

example, Matthew Pethers's article "'Balloon Madness': Politics, Public Entertainment, the Transatlantic Science of Flight, and Late Eighteenth-Century America" was a rare treatment of balloons and literature when it was published in 2010. Pethers argued that ballooning became "a metaphor for intellectual delusion and social upheaval" in the writings of Irving, Emerson, Poe, Twain, and James (216). Recent balloon scholarship has revealed, however, that ballooning had rapidly acquired much of this turbulent reputation in Europe before it drifted through America in the nineteenth century. Moreover, I argue in Chapter 2 that human flight had already been serving as a metaphor for delusion and upheaval for more than a century before 1783.

Ballooning is a natural-seeming place to begin a study of human flight, but the development of human flight, scientifically and culturally, cannot be isolated to a single event or year. Existing scholarship neglects the crucial century before the first working flying machines were constructed, and the excellent recent books on early human flight limit themselves to events from 1783 onwards. Their focus may span years, decades, or centuries after 1783, but scholars of early flight invariably note that the dream of flying predates ballooning and even experimental science itself. It seems natural to begin with the first successes, but science is a story of failures as well as successes.

In previous scholarship, the emphasis on 1780s' balloonomania has obscured the interest in human flight that existed throughout the eighteenth century. Earlier ideas about human flight do not disappear after 1783 but are instead reconfigured and renewed as what Wai Chee Dimock calls "emerging phenomena." Early flights

refuse to stay silent or become irrelevant with the passage of time. For example, as I discuss at length in Chapter 2, the name "Wilkins" was associated with flight long Robert Paltock published his novel of a sailor shipwrecked in a mysterious land inhabited by a society flying islanders, *Peter Wilkins* (1751). Paltock's novel combined seventeenth-century ideas about human flight with the popular form of imaginary voyage literature that included Daniel Defoe's *Robinson Crusoe* (1719). In turn Paltock's own particular vision of flight continued to evolve as semantic networks changed around it. The novel received a newly illustrated edition in 1783, the year of the first balloon flights in France, and then another new edition in 1784. Paltock's novel found new life with the launching of the French balloons, however, receiving a newly illustrated edition in 1783 and then another new edition in 1784, guaranteeing that the book remained in ready circulation through the highs of English balloonomania. Rather than staying put in 1751, the novel was revived and became a Romantic favorite and the source of several stage adaptations.[5] After 1783, Paltock's flying islanders circulated within a new semantic network: a world in which technological innovation had transformed *flight* from fantasy to reality. Old ideas about flight remained current despite the changing times, and the surging interest in human flight activated old criticisms of flight that might have remained settled and dormant. Similarly, Ariel's flights had a new context when *The Tempest* was republished and performed in 1785. In these brave new worlds, brave old words resonated with surprising power and imagination.

[5] I explore these illustrations and stage adaptations in Chapter 3.

To interpret the phenomenon of 1780s' ballooning, we must have a prehistory of ballooning, including the cultural conditions, terms, and literary forerunners that preceded balloonomania. A century before the shadow of the Montgolfier first rose over Paris, doubts regarding and even passionate opposition to human flight were common among serious philosophers, interested amateurs, and common Britons alike. While some monograph-length studies discuss early ballooning in whole (Michael Lynn's *The Sublime Invention: Ballooning in Europe, 1783–1820*) or in part (a chapter in Richard Holmes's *The Age of Wonder*), these works are frequently produced by historians working within history studies, not literary studies, and, for all their strengths, also frequently repeat clichéd assumptions about "the Romantic Generation." A narrowly Romantic interpretation is, moreover, another consequence of considering ballooning only as a wondrous invention of the 1780s rather than more broadly as part of a longer history of human flight. Building on Dimock's diachronic historicism, Rita Felski observes: "That certain texts survive, and others do not, is not just a matter of particular texts resonating with individual readers, but also of structures of gate-keeping and evaluation, of selection and omission" (580). By beginning with balloons or, worse still, with the airplane, histories of flight have excluded significant cultural movements in the history of science from their analysis. With my dissertation, I put major Restoration and eighteenth-century texts and events in conversation with some texts and events that are now deeply obscure. In the early story of science and early human flight, however, these narratives resonated not only in their own time but throughout the following decades and, in some cases, centuries. These

resonances will remain unfamiliar to us today unless we make a deliberate effort to seek them out and listen to their stories.

Literary and scientific culture both operate more by accretion than by replacement. That is to say, new novels do not eliminate the market for old novels, and older scientific ideas remain influential even as they must compete with newer ideas. Contrary to popular perceptions, science is not a relay race, with ideas handed from scientist to scientist, advancing along a linear track. In "The Specificity of the Scientific Field and the Social Conditions of the Progress of Reason," Pierre Bourdieu describes this idealized, simplified scientific process as "the perfect competition of ideas, a contest infallibly decided by the intrinsic strength of the true idea," but reality is messier (31). Other sociologists and philosophers of science have likewise been critical of clean, orderly models of scientific progression, what historian of science Thomas S. Kuhn calls "normal science" (24).[6] The flourishing of so-called scientific racism in the mid-nineteenth century and its ugly persistence even today demonstrates that not only are bad ideas not always uprooted by good science but also that they can flourish if the culture permits.

As the Balloon Flies

Much like the eccentric flight path of a balloon, the history of human flight is full of false starts and unexpected continuations. Individual motions have their

[6] For progress modeled as a series of paradigm shifts, see Kuhn's *The Structures of Scientific Revolutions*. For more polemical accounts of objectivity in scientific progress, see the writings of Bruno Latour, especially early works such as *Laboratory Life: The Social Construction of Scientific Facts* (1979) and *The Pasteurization of France* (1988).

reasons, but their logic collapses when scrutinized as a whole. Jean-François Lyotard wrote of modernity that a break with the past is in fact "a manner of forgetting or repressing the past. That's to say of repeating it. Not overcoming it" (171). The beginnings of modern science are no exception to this aimless, sometimes progressive, sometimes regressive, movement. In 1753, Ephraim Chambers defined *bizarre* as "a term used among the florists for a particular kind of carnation, which has its flowers striped or variegated with three or four colours," much like the longitudinal stripes of a colorful balloon. The bizarre history of human flight is variegated with its many genres ranging from the most serious theological and philosophical essay to the most ludicrous farce, from soaring poetry to absurd cartoon. Shared beliefs about the means and profound meaning of flight align authors even when they otherwise disagree.

Where authors disagree—is flight possible, what flights are realistic, how should wings look—offers a glimpse into debates and imaginings of a technological revolution. In "The Standard of Taste," David Hume observes that the poet "ARIOSTO pleases; but not by his monstrous and improbable fictions, by his bizarre mixture of the serious and comic styles, by the want of coherence in his stories, or by the continual interruptions of his narration" (138). In this study, I sketch the early modern development of human flight as an irrational, bizarre story full of gods, mortals, and strange machines. Wolfram Schmidgen has argued that Restoration philosophers came to see mixture as an improving process, one that combined strengths and discarded weaknesses, and I see the Restoration and eighteenth-century fascination with flight as a particularly complex mixture, one

whose strange combinations create new, astonishing possibilities. The history of early human flight is a disorderly story of wonderful science.

In recent years, more scholars have begun to admit the importance of wonder to scientific practice and culture. In *Eighteenth-Century Fiction and the Reinvention of Wonder*, Sarah Tindal Kareem describes wonder as an affect of "surprise and marvel" and as a state of "doubtful curiosity" (8). Kareem argues that eighteenth-century authors "solicit wonder at real, ordinary objects . . . by adopting techniques used by seventeenth-century scientists and Protestant writers to make the familiar seem strange" (3). Doubtful curiosity, therefore, identifies a dominant tendency of the era, a driving force enjoining the educated to ask questions. Wonder has a long history as a friend to the advancement of knowledge. In *The Age of Wonder: How the Romantic Generation Discovered the Beauty and Terror of Science*, Richard Holmes begins his book with Coleridge's translation from Plato: "In Wonders all Philosophy began: in Wonder it ends . . . But the first Wonder is the Offspring of Ignorance; the last is the Parent of Adoration" (XX). Wonder fuels scientific advancement, but, paradoxically, many historical natural philosophers also see wonder as a childish impediment to be overcome. In *Wonder and Science: Imagining Worlds in Early Modern Europe*, Mary Campbell explains wonder as "a drag" on an Enlightenment epistemology of singular Truth, a force opposing the corrective education of devalued minds such as those of children, women, and non-Western cultures (5). The bias evident here unmasks the irrational humanity that is present even in the heart of science.

Current work in the study of science reevaluates the conventional standing of science. Science studies rejects science as an ideologically naïve, neutral ground of facts. Instead, science is situated as a deeply human project for understanding an inhuman world. Bias—philosophical, moral, political—shapes understanding of phenomena, and flight is no exception. In the 1780s, some English commentators distrusted the foreign innovations of the French aeronauts, and some sought to claim ballooning, at least in its technical, chemical aspects, for English nationalism. Meanwhile, as I discuss in Chapter 3, other nations likewise attempted to establish a claim of prior art over ballooning by pointing towards earlier inventions, both real and imaginary, by engineers working in Portugal, Spain, and elsewhere throughout Europe. More than aerodynamics, empire directs the ambitions and understanding of human flight.

Recent work in eighteenth-century studies as well as our current technological and political currents reveal the vibrancy of what might be dismissed as empty space.[7] Our growing awareness of air in our own age has shown a light on a similar development in the eighteenth century. In *British Weather and the Climate of Enlightenment*, Jan Golinski observes that eighteenth-century meteorology combines classical authorities, vernacular lore, and new natural philosophy. These varied sources grappled with tropical hurricanes, volcanic emissions, and the London smog that Jayne Lewis notes became "vapors so thick and shapely as to

[7] In *An Empire of Air and Water: Uncolonizable Space in the British Imagination, 1750-1850* (2015), Siobhan Carroll calls such spaces *atopia*, "natural spaces resistant to large-scale human settlement and colonization" (11).

compel those who inhaled them into complex reflection on and through them" (*Air's Appearance* 5). Whether motivated by natural or human causes, air intrudes into human affairs. In "Living with the Weather," Jonathan Bate draws on Latour's critique of the imagined division between culture and nature, and Bate calls weather "the primary sign of the inextricability of culture and nature," a natural phenomenon that refuses to be contained within the laboratory (439).[8] In the eighteenth century, extreme weather cancelled balloon launches, but aeronauts were also fascinated by the meteorological potential of machines that could carry them above low-lying storms. Weather constituted both a hazard to balloons and a reason for their existence.

Flying machines created meaning in empty space but also drew upon that space for meaning. Today, the aerial atopia has become littered with satellite debris, and communication technologies such as the emerging 5G wireless standard compete for bandwidth in an increasingly crowded electromagnetic spectrum. More ominously, a clear, blue sky may portend undetectable drone strikes or belie pollution that threatens human health and climate worldwide. People do not become gods or even angels when they enter the heavens; they remain people.[9] My dissertation examines the aura of transcendence that human flight borrowed from

[8] Nonetheless, Latour's recent work has stressed the importance of accepting scientific authority in order to combat climate change. See Latour's *Down to Earth: Politics in the New Climatic Regime* (2018).

[9] Of course, angels and demons do not entirely cede the sky to human aeronauts, and supernatural flight remains a common motif throughout the four chapters of this dissertation. See in particular the antiaerial speculations of European divines in Chapter 2 and the spiritual visions of Chapter 4.

the sky and how persistent that aura proved despite the dangers and disappointments would-be aeronauts found in the sky.

In ways literal and figural, the topic of flight offers an advantageous bird's-eye-view of human enterprise. Humans are born without wings, a vitally important natural fact. To some in the eighteenth century, this bodily, material lack serves as a natural barrier to curb humanity's vaulting ambition. To others, that lack is to be liquidated through technology. Pigeons and other scavenging birds live on the refuse of human society, yet their bodies exceed our own capacity for flight, making a mockery of hard-won technological achievement. Machines embody human ambition even as they expose the insufficiency of the human body. Natural or mechanical, wings extend the human body. If they fail, wing and body alike are destroyed. Today, at a point in time when technological advances are as perilous as they are promising, my research on flight applies the methods of the humanities to analyze the global, societal, and personal relationships that humans form with technology.

The four chapters of this dissertation are arranged sequentially by their major interests, but each text also concerns how those interests developed throughout the period. Chapter 1 surveys the extreme variety of early flight narratives and offers conceptual tools for understanding how later flight narratives related to texts written ten years, a hundred years, a thousand years earlier. Chapter 2 examines prominent flight texts from the late seventeenth and early eighteenth century to show how authors and philosophers established an enduring skepticism towards human flight. Chapter 3 studies how flight balanced innovation and

convention throughout the eighteenth century with particular interest in how this dynamic progressed after 1783 and the invention of the first successful flying machines. Finally, Chapter 4 concludes the dissertation with a correction of conventional wisdom about flight, real and imagined, leading into the Romantic period. At the end of the long eighteenth century, as throughout, the absence of sustained revolutionary change conceals a sophisticated, nuanced pattern of continuity and transformation.

With regards to method, each chapter deploys a combination of historical and literary analysis suitable to my objectives for that chapter and for the dissertation, which is a historical study of predominantly literary subjects. Chapters 1 and 4 have a relatively greater focus on literary analysis than other parts of the dissertation. Chapter 1 focuses on literary forms and techniques to model human flight, a phenomenon that was, throughout most of human history, inextricable from fictionality. Chapter 4 pays greater attention to individual authors who continued to use a literary form, the cosmic voyage, long after its traditionally recognized seventeenth-century heyday. By contrast, Chapters 2 and 3 concern themselves chiefly with less explicitly literary, more broadly cultural-historical matters. Chapter 2 studies a widespread attitude of antiaerial sentiment evidenced in scientific as well as literary writing, while Chapter 3 historicizes late-eighteenth-century pantomimes—performances of low literary status—as part of a wide-ranging public occupation with flight that pervades non-literary entertainments and the development of flying machines themselves. Each chapter is limited in the number of avenues for inquiry that it can pursue without falling off course, but I hope my

work here will provide readers with able means to follow their own interests within the many realms of air.

Chapter 1. Vastness of the Sky: Understanding Early Flight Narratives

In this chapter, I introduce a new theoretical framework for understanding the tremendous diversity of early flight narratives. Previous scholarship on early (pre-1783) flight has often pursued an extremely narrow scope, focusing on topics such as voyages to the moon or representations of flight in mythology. The great variety—formal, generic, thematic, etc.—of early flight narratives has hitherto resisted classification and description. I propose a comprehensive theory of flight (dianoia-realism coordination) that recognizes the many different forms and functions of flight in literature. Drawing on qualitative research methods initially developed in sociology, I have applied a grounded theory approach in the analysis of fifty early flight narratives. Through this work, I have identified two central questions: (1) "To what degree is the flight represented in a narrative realistic or idealized?" and (2) "To what degree is the narrative itself literal or symbolic?" These two questions are sufficient to map any individual flight narrative onto a larger tapestry of early flight discourse.

Using this framework, I identify clusters of flight narratives that share similarities, such as romantic fantasies of magical flight or heroic-tragic accounts of early balloon adventures. Recognizing these clusters recontextualizes previous research that has focused on isolated texts or small groups of texts without reference to the broader conventions of flight narratives. My theory puts these clusters into comparative relationships with dissimilar clusters within the larger

body of early flight narratives. Lastly, dianoia-realism coordination illuminates unpopular, rare uses of flight in eighteenth-century literature, and I argue that identifying anomalous texts reveals not only how authors thought about flight but also how they generally did not think about flight. This holistic view of a wide range of flight narratives indicates what historical readers might have known or assumed about flight when the phenomenon is encountered as a part of individual stories.

For example, I argue that previous scholarship has not identified the ways in which the scientific literature of flight drew on prior conventions of popular forms. Instead, scholars of balloonomania have largely confined their studies to the representation of ballooning in those forms, e.g., Elizabeth Inchbald's inclusion of a balloon in *The Mogul Tale: or, the Descent of the Balloon* (1784). This movement between domains, however, between scientific and entertainment, can flow in both directions. Using dianoia-realism coordination, I classify Tiberius Cavallo's *The History and Practice of Aerostation* (1785) as a work of educational history closely related to novels as well as to treatises. I argue that the text's rich descriptions and instructions on how to best enjoy its dramatic illustrations create a reading experience that uses imagination to augment the book's carefully recorded measurements of altitude and other quantifiable data. This new taxonomy of flight literature offers not only a systematic language for describing the different kinds of flight narratives common throughout the long eighteenth century but also contributes to the critical study of flight narratives. Dianoia-realism coordination unveils the narrative machinery that undergirds and structures the extensive literature of early flight.

Chapter 2. Mocking Icarus: Antiaerial Sentiment in Science Satire

Recent scholarship on ballooning notes the sometimes skeptical reception the balloon received, but criticism of aerial projects actually belongs to a long-standing scientific tradition. In Britain, the Royal Society was charged with improving useful arts, and no shortage of projects proposed establishing a new territory in the air. After all, some Irish bogs could be made arable through methodical drainage, and a world-wide empire was built on the ocean. Yet the art of flying proved immensely controversial a full century before the first balloon flights of 1783. Well-studied satires by authors such as Thomas Shadwell, Aphra Behn, and Jonathan Swift have been widely recognized as critiques of early science, but I argue that their mockery of human flight cannot be understood without considering these works as part of a larger body of scientific and popular literature opposing human flight on principle.

A scientific theory of natural forces (e.g., the elasticity of air or mechanical efficiency) helped would-be aeronauts to identify better the physical requirements of human flight, but this knowledge could also make human flight seem impossible more clearly than ever. Their tremendous difficulty made aerial projects the subject of doubt and ridicule before and after the invention of aerostatic ballooning. John Wilkins's landmark mechanical treatise *Mathematicall Magick* (1648) and William Derham's natural theology treatise *Physico-Theology* (1713) argue that the pursuit of flight technology was, at least for the moment, wasteful and unproductive. At worst, flight technology even threated to create civilization-ending weapons. Recognizing the broader context of antiaerial sentiment reveals that the aerial

elements in early satires on science indict a specific kind of natural philosopher who neglects social and scientific responsibility to grasp at castles in the air.

Antiaerial writing prospered in the early decades of the Royal Society as fellows and observers debated the values and limitations of the new science, but the underlying skepticism towards flight persisted throughout the eighteenth century. To most authors, human flight seemed settled as a scientific question barring some new, significant advancement in the mechanical generation of power. Like so many other eighteenth-century schemes, flight remained out of reach. When aerial projects found new life in the wake of the 1783 ascents, their culture of celebrity did not reassure skeptics that the balloons were anything other than frivolous at best and lethally reckless at worst. After all, Satan flew higher only to fall farther, and Icarus, unlike Satan, is mortal. Throughout the period, authors readily employ imaginative and frequently mythological attacks to deflate the overly ambitious. Nothing is more ambitious than flight.

Although in this chapter I am mainly focused on harsher, Juvenalian satires, this chapter also places more gently didactic texts such as Samuel Johnson's *Rasselas* (1759) into a more clearly delineated conversation with the century's antiaerial sentiment. Speaking sympathetically in *The Botanic Garden* (1791), Erasmus Darwin memorialized the 1785 death of celebrity aeronaut Pilâtre de Rozier as the sinking of a "hapless Icarus on unfaithful wings." A familiar Classical reference point, the story of Daedalus and Icarus drags down many a dream of flight in the long eighteenth century, and numerous thinkers from the seventeenth century onwards regard aerial ambitions as dangerously arrogant. In *The Marriage of Heaven and*

Hell, Blake writes that "No bird soars too high, if he soars with his own wings" (36). Born without wings, humans soar perilously, and the extensive body of antiaerial writing indicates that satirists who invoke flight make a particularly grim statement about the dangers of human overreach.

Chapter 3. Performing Flight: Wings on Balloons and in the Theater

The first human-occupied Montgolfier balloon was emblazoned with solar emblems, heraldic eagles, and the signs of the zodiac, but scientific flight's entanglement with its cultural context was more than superficial. In this chapter, I extend my analysis beyond scientific and literary writing to examine the image of flight in the long eighteenth century. Drawn representations of flying machines appear in sources as diverse as fanciful illustrations in novels, satirical cartoons, and serious technical diagrams, and ideas circulated readily between sources and even between fiction and reality. While previous historians of balloonomania have noted the often-theatrical atmosphere of balloon launches, I argue that these launches were not just inspired by the theater but were instead active participants in a broader dramatization of human flight. Nineteenth-century artifacts commemorating the history of human flight list fictional flying machines alongside real ones, and in this chapter I offer my explanation of this bizarre phenomenon.

The key observation of my analysis is the strange persistence of animal-like wings even in the face of strong evidence indicating that such wings were unsuitable to human flight. Since time immemorial, humans had looked to avian wings as a familiar, natural proof-of-concept for the flight, but seventeenth-century authors demonstrated mathematically the tremendous physiological differences between

human bodies and birds, and stark differences in wing-muscle-weight ratios seemed insurmountable. Furthermore, numerous alternatives to winged flight existed. Buoyancy, for example, sustained both an ever-growing shipbuilding industry as well as the triumphant successes of ballooning late in the eighteenth-century. Buoyant airships were even proposed multiple times throughout the seventeenth- and eighteenth-century, yet these airships designs seem to have had only erratic influence on the course of popular and scientific thinking about flight throughout the period. Most confounding of all, balloons flew without wings but seemed to require them, and winged balloons, real and imagined, became astonishingly common. Far from abandoning the winged tradition, balloons were instead swept up in a cultural current that insisted that wings belonged on a flying machine.

By considering the many images of flight that circulated in print, in the theater, and even in the sky during the long eighteenth century, we develop an appreciation for interconnectedness of these media. Balloonomania has nothing to do with realism. Inaccurate and even fantastical flight images circulate alongside realistic ones and blur distinctions between reality and the imagination. While some balloon flights on the stage were more realistic than others, many mixed promiscuously with earlier tropes of flying spirits and magic chariots. Flying machines had long been used on the stage to represent supernatural flight, and the kinds of spectacular stage entertainments that were most likely to feature a balloon also happened to be the forms of entertainment most likely to have established conventions for supernatural flight. In Charles Dibden's *The Vicissitudes of Harlequin* (1790), for example, benevolent witches aid in Harlequin and Columbine's escape in

an air balloon, and they are soon followed by a monkey dressed as Jupiter in a flying car drawn by an eagle. Philosophers as well as dramatists regarded the past not as a graveyard of dead ends but as a lively stockyard for fashioning new developments out of old ideas.

Chapter 4. Cosmoscope: Visions from a Distant Star

In this concluding chapter, I identify a narrative technique that links the earliest flight narratives to flight narratives taking place even decades after the invention of ballooning. This analysis adds a new formal and historical perspective to the largest subset of flight narratives: cosmic voyages, in which an imaginary traveler journeys beyond the atmosphere to the moon, the sun, or some still more distant destination. The cosmic voyage is a recurring flight plot that promised the furthest imaginative reach as well as the greatest real-world challenges. Along the way, the traveler reflects with new clarity and objectivity on the sights of the universe and on a faraway home. In Chapter 2, I discussed human flight's reputation as an arrogant, dangerous ambition. In this chapter, I examine how a cosmic perspective, which I term the cosmoscope, reveals the best of human nature as well as the worst.

The central text of my analysis in this chapter is Percy Bysshe Shelley's long, philosophical blank verse poem *Queen Mab* (1813). The youthful Shelley had a long-standing affinity for flight; he enjoyed toy balloons, and a sonnet titled "To a Balloon laden with Knowledge" is among his juvenilia. Shelley believed that scientific progress and moral progress proceed along a linear, upwards track; according to his friend and biographer Thomas Hogg, Shelley believed that aerial surveys of Africa

by balloon would change European perspectives and "annihilate slavery for ever" (63). For his great philosophical declaration in *Queen Mab*, however, Shelley deploys a magic chariot instead of a balloon in order to reach the greatest imaginable heights. Shelley joins science and magic to fully embrace the philosophical flight of fancy. The cosmoscope technique, observing a distant world viewed from above, offers Shelley a liberating frame of reference untethered from present limitations.

This distant, all-seeing perspective characterizes a subset of the larger set of cosmic voyage literature, which is itself a subset of the larger set of imaginary voyage literature, as I discuss in Chapter 1. Cosmic voyages were most popular in the wake of sixteenth- and seventeenth-century discoveries in astronomy. German astronomer Johannes Kepler not only codified the laws of planetary motion but also wrote an autobiographical fantasy about outer space. *Somnium* (written 1608, published 1634) includes witches, demons, and an abundance of mathematics, a feature that became typical of later cosmic journeys, including Shelley's. In the mid-eighteenth-century, colonial and imperial activities abroad caused the cosmic voyage to be briefly eclipsed by more terrestrial narratives, such as *Gulliver's Travels*, but examples of the cosmic voyage persist throughout the eighteenth century, including Voltaire's *Micromégas* (1752) and William Blake's *An Island in the Moon* (1784). This chapter concludes the dissertation by recognizing how a nineteenth-century text, written by an author steeped in the latest science decades after the invention of ballooning, nonetheless operates within the earlier tradition. The historic invention of ballooning had minimal direct impact on the cosmoscope

literary technique, which deployed a transcendent, visionary perspective beyond even the reach of the aeronauts.

Technologies Real and Imagined

Flight offers tremendous power to elevate and to destroy, and the history of flight technology underscores the need to probe a scientific past in order to understand a scientific present and to anticipate a scientific future. In the early history of human flight, old fantasies not only failed to be replaced by scientific discoveries but instead played a far greater role in directing the course of scientific research than scholars have hitherto acknowledged. A prehistory to balloonomania challenges our perceptions both of the scientific method and of the relationship between scientific and popular literature. Historical engagement with human flight requires reading newspaper advertisements and scientific papers alongside folklore, art, and imaginative writing. The culture of early flight is an explosive mixture, and the resulting contradictions should be unsurprising. After all, carefully measured experiments on invisible gasses paradoxically created the public spectacle of enormous balloons exhibited before eager crowds. Disruptive combinations had consequences both large and small, rippling across literary genres and scientific thought throughout the long eighteenth century. In this strange turbulence, even the sky became contested, with combatants ranging from imaginary empires in the stars to real and growing empires on Earth.

On a smaller scale, I seek to make sense of what happened with the 1783 invention of ballooning. In response to early skepticism of balloons, Benjamin Franklin is reputed to have asked "What good is a newborn baby?" A child does not

develop in a vacuum, however; its upbringing depends significantly on factors that existed before its birth, such as its parents and environment. Understanding the balloon requires an understanding of the preconditions of its birth. Despite being a wondrous and sudden invention, ballooning was quickly absorbed into a scientific and popular culture that had very clear expectations of the mechanics, utility, and signification of human flight. Understanding these expectations, such as the expectation that flying machines have wings or the expectation that flying machines would be profoundly useful, requires us to let go of a narrow focus on balloonomania. The method of flight remained firmly secondary to the purpose of flight. Even as the mechanics of wing designs remained a point of scientific interest, authors speculated far more widely on the monetary, martial, and moral consequences of flight. Ballooning universally disappointed expectations in all these domains because it failed to provide the perfect movement envisioned by flight's dreamers. Although able to go everywhere, the wandering aeronaut could not go anywhere in particular. Wingless, rudderless, useless—balloons failed to propel human flight to any practical commercial or military value and abandoned their creators' profound ambitions firmly on the ground.

When balloons failed to live up to expectations, inventors sought answers in traditional thinking, and the flight culture that predates balloons explains both the origins of these expectations and the intellectual field from which solutions could be drawn. In one particularly memorable episode of early flight that I will return to in Chapter 3, an inventor named Edward Eldred promised to divulge the secret of steering balloons if the public would raise a subscription for his discovery. Alas, we

shall never know Eldred's secret because his final, bitter newspaper advertisement laments the public's failure to support the arts and sciences. This failed exercise in eighteenth-century crowdfunding illustrates more than the invective of a defeated huckster. A central assumption of my research has been that science does not exist apart from culture, in the long eighteenth century or today. William Blake's proverb that "What is now proved was once, only imagin'd" has become a cliché, but science fantasy and scientific development have an intimate, complex relationship. Understanding the invisible currents that surrounded human flight teaches us not only about balloons but about the science and imagination that made them possible.

Chapter 1. Vastness of the Sky: Understanding Early Flight Narratives

Walking on Mountains or flying in the open expanse of heaven

She heard sweet voices in the winds & in the voices of birds

—William Blake, *The Four Zoas*

The tales of flight that circulated in England during the long eighteenth century are many and various. A god drives a flaming chariot through the daytime sky. Below, a skeptical experimenter calculates how much force it would take to raise a human body off the ground. In a distant land, anthropomorphic birds introduce flight to a shipwrecked human visitor. A real French locksmith becomes famous for flying with a pair of hinged paddles while a fictional English blacksmith accidentally flies to the moon on a mechanical eagle. Accidents proved a popular theme, with adventurers carried aloft by rogue waterspouts, giant birds, firework explosions, and, late in the century, wayward balloons. Some philosophers, theologians, poets, and playwrights turned flight into serious intellectual work, a vehicle for geographical or moral education. Other authors used flight simply because it made for a rollicking good story. This expansive variety testifies to the high interest in flight throughout the early modern period, long before the invention

of ballooning.[10] For the scholar studying the culture and history of human flight, however, these winds seem to blow from all directions. The hurricane threatens to send the inquiry hopelessly off-course.

In approaching this aerial miscellany, previous scholars have accordingly attempted to define their subject along varied lines. In the introduction to this dissertation, I discussed how recent scholarship on balloonomania has taken too short a view of eighteenth-century flight and treated flight as a post-1783 phenomenon, and I contended that flight had a much longer, livelier prehistory than has been generally recognized. In this chapter, I argue that what excellent scholarly work has been done on earlier flight has not produced a comprehensive theory for understanding the diverse modes of flight literature. From my review of the existing scholarship on early flight, I identify four practical requirements that such a theory must satisfy. In surveying early flight narratives, I have identified two key variables for classifying flight narratives: (1) what purpose does the flight serve in the narrative and (2) to what degree is the flight represented as a technology? By applying these two questions to an initial set of fifty early flight narratives, I have been able to explore trends that emerge in this body of literature. My findings offer answers to questions about flight in eighteenth-century English culture. What did flight signify in literature? What was the relationship between scientific treatises on

[10] Throughout this dissertation, I have considered the long eighteenth century as roughly 1660–1830 (approximately the Restoration through Romanticism), and the early modern period as roughly 1500–1800 (mainly a century-based designation but coinciding approximately with Leonardo's work on flight and the development of early ballooning). As I discuss throughout this dissertation, early flight publications often remained available or at least known long after their initial occurrence and remained culturally active.

flight, satires on science, and stories that simply enjoyed a magical flight or two? What kinds of flight appear only rarely in the literature and why? To answer these questions and others requires a comprehensive view of eighteenth-century flight narratives, a view from above.

Multitude of Flights

In her seminal study of early modern flight literature, *Voyages to the Moon* (1948), Marjorie Hope Nicolson organizes the chapters of her survey according to the four most familiar mechanisms of flight set out in the seventeenth century: flight by the aid of spirits, flight by the aid of fowls, flight by artificial wings, and flight by flying chariot. Three hundred years earlier, in his book *Mathematicall Magick* (1648), John Wilkins had described these four mechanisms as the means by which it was commonly supposed that human flight might be attempted, and Wilkins's thinking pervades seventeenth- and eighteenth-century discussions of flight. Nicolson's study dedicates a chapter to each avenue, and this arrangement has historical advantages in mirroring Wilkins's categories. This organization, however, also creates strange bedfellows within the chapters. In the chapter "Wanton Wings," the Daedalus and Icarus myth, Lucian's *Icaromenipus* (c. 150 CE), Thomas Shadwell's *The Virtuoso* (1676), and Robert Paltock's *Peter Wilkins* (1751) all feature winged humans, but these wings vary immensely in their respective natures and narrative functions. Grouping them simply by mechanism is encyclopedic and logically satisfying, but it is not especially analytical and not especially useful except as a broad introduction to the literature of early flight.

Moreover, Nicolson's elegant chapter arrangement is marred by an additional and inconvenient set of other/miscellaneous texts, those flights whose mechanisms do not clearly belong to the four categories established by Wilkins. Nicolson's study does not extend late enough to encompass the literature of balloonomania, but the book has an additional, catch-all chapter titled "Variations on a Theme." This Other category features flight by dream, flight by giant, and flight by falling down a rabbit hole, among other oddities.[11] Strictly speaking, Nicolson's declared subject is the literary cosmic voyage, but her arrayed examples include many flight narratives that are neither cosmic nor voyages, such as the rumored flights of legendary and historical persons. Flight is a popular, wayward theme that wanders across many different genres and modes. If we set our bounds too narrowly, we will inevitably find our course drifting over those same boundaries. An improved taxonomy of early flight narratives must embrace the complex variety of those narratives.

Balloonomania represents the most direct branch of current research on early flight narratives, but significant relevant research has also been done on imaginary voyages, which often feature flight as part of foreign lands or the travel to those lands. The abiding popularity of Jules Verne's nineteenth-century *voyages extraordinaires* made imaginary or fantastic voyages of any century a source of critical interest throughout the twentieth century in studies such as Nicolson's work

[11] Despite being published in 1865, Lewis Carroll's *Alice in Wonderland* is playfully included in Nicolson's survey.

on cosmic voyages or Philip Gove's *The Imaginary Voyage in Prose Fiction* (1961).[12] More recent work, such as Judy Hayden's edited collection *Travel Narratives, the New Science, and Literary Discourse, 1569–1750* (2012) and Jason Pearl's *Utopian Geographies and the Early English Novel* (2014), examines voyages in the light of current critical developments in both science studies and postcolonialism. These additional theoretical perspectives highlight the fluid boundary between real and imaginary places in early travel narratives as well as the role flight often plays as a largely arbitrary vehicle in an author's creation of variety and novelty. These studies of imaginary voyages rarely take an explicit interest in flight as flight, and, after all, not every literary flight is a voyage. Rather, this scholarship examines flight as a common feature—but not a defining feature—of a subset of prose fiction, and accordingly it excludes flights that do not travel and flights in other genres. Early flight narratives are not neatly contained within an existing body of more general research, such as imaginary voyages. An improved taxonomy of early flight narratives must attend to the particularity of flight *qua* flight, not merely as a vehicle for voyages.

Flight narratives vary in their particulars; sometimes the operant mechanism of a flight is irrelevant, and sometimes it is central to the meaning of the narrative.

[12] This research was further fueled by new explorations including deep-sea dives by scientific submersibles and the successes of NASA and space programs worldwide. In my survey of twentieth-century studies of the imaginary voyage, I have observed that the common, introductory rhetorical move is to begin with a remark on how commonplace some previously miraculous technology has now become and to end with a gesture towards new frontiers. When reading predictions of future technology, whether those predictions are from the twentieth century or hundreds of years earlier, a modern reader is simultaneously pleased by the ways in which the present has exceeded expectations and embarrassed by the ways in which the present has lagged behind earlier prognostications.

The particulars of flight narrative require a reader to keep an open mind about what flight might be or how it might look. In *The Flying Machine and Modern Literature* (1986), Laurence Goldstein largely disregards early flight as not really flight. Goldstein is fascinated with Leonardo da Vinci, and, typical of modern admirers of the great sixteenth-century polymath, Goldstein eagerly claims Leonardo as the direct father of the great work completed by the Wright brothers. In drawing this short line of descent, however, Goldstein erases four hundred years between Leonardo's *Codice sul volo degli uccelli* (c. 1505) and the 1903 Kitty Hawk flights. Leonardo's notebooks remained almost universally unknown throughout the eighteenth century and only slowly became recognized in the nineteenth century, but his insights into the forces of gravity and lift on a bird's wing would have been more significant had they been more widely known earlier in scientific history. Likewise, the successful Wright *Flyer* was a tremendous feat of engineering; the Wright brothers developed only limited theory to explain their machine, but their practical results were undeniable. Goldstein restricts the title of *flying machine* to heavier-than-air flying machines, arguing that "[w]ithout agreement on a comprehensive definition of what a flying machine was, it would be impossible to disqualify the many predecessors of the Wrights, including the balloonists, whose inventions fell short of the *Flyer*'s unique authority" (7). In a way, Goldstein is correct: without narrowly defining flying machine, it would be impossible to disqualify the Wrights' predecessors from their place in scientific history.

It is unnecessarily capricious to valorize three heroes of science at the expense of their more forgotten intermediaries. Goldstein resigns the period

between Leonardo and the Wright brothers as the domain of "apparently significant numbers of cranks and geniuses [who] threw themselves from rooftops and ran down hills with a mechanism attached to their shoulders," and he argues that "the theory of flight made little progress, even in the eighteenth century when the vogue of ballooning distracted most people from the hopelessness of heavier-than-air ascent" (41). Goldstein's study of the ways in which flight remained a mythic phenomenon throughout the twentieth century is wide ranging and perceptive, but his bias against counting balloons as significant achievements in the history of human flight seems arbitrarily hagiographic in its service of Leonardo and the Wright brothers.[13] Admittedly, balloonists did labor under technical limitations that severely limited the utility of lighter-than-air flying machines until the end of the nineteenth century. Nevertheless, balloons were universally identified as flying machines at the end of the eighteenth century and throughout the nineteenth century. An improved taxonomy of early flight narratives must recognize a multitude of flight technologies.

At the same time, it is also possible to extend the idea of flight technology too far. In *Stranger Magic: Charmed States & the Arabian Nights* (2011), Marina Warner makes a nearly unique contribution to the scholarship of early flight narratives by recognizing the influence of eighteenth-century Orientalism. The first major

[13] Goldstein's analysis has, however, its dark side. In one section titled "The Necromancer" (without any mention of the eighteenth-century pantomime by that name), Goldstein offers a Freudian reading of Leonardo's relationship with mechanical warfare and declares that "Leonardo has no conscience" (31). Goldstein's book overall is chiefly concerned with flight in the twentieth century, and so it is no wonder that he looks for an early modern antecedent for understanding the violence of twentieth-century military aircraft.

European translation of the Arabic ألف ليلة و ليلة [*Alf layla wa-layla, A Thousand Nights and a Night*] was Antoine Galland's twelve-volume French translation-adaptation *Les mille et une nuits* [*One Thousand and One Nights*] (1704–1717), followed closely by anonymous pirate translations in England, the popular "Grub Street" texts of *Arabian Nights' Entertainments*, which were published in pieces in London from 1706 onwards (Warner 13, 76). In reading Warner's account, I am particularly struck by the stories' influence on eighteenth-century British pantomime and dramatic spectacles, an understudied area of literature where the spectacle of flight flourished.[14] The introduction of these tales into English culture ranks among the significant events in the development of early flight narratives alongside the scientific discoveries of early modern astronomy, the development of experimental science, and, later, the invention of the aerostatic balloon.

At the same time, Warner's account seems strangely unaware of earlier, existing flight traditions in English and European literature. This disconnect causes her to assume, much as Goldstein does, that the early modern period in general and the eighteenth century in particular were fallow periods for thinking about flight. This assumption leads Warner to overread the influence of *Arabian Nights' Entertainments* in England, interpreting the tales as the most significant forebears of all eighteenth-century flight narratives. This practice falls short in distinguishing between different mechanisms of flight, and Warner classifies flying carpets, aerial spirits, giant birds, and more prosaic flying machines under the same concept of

[14] I return to dramatic spectacle in general and Oriental-inspired productions in particular in Chapter 3.

flight technology/magic. *Stranger Magic* is one of the most meditative scholarly treatments of flight as flight, but the realistic worlds of some flight narratives before and after 1704 function differently from the idealized worlds of *Arabian Nights' Entertainments.* Both should be accounted for as flights without obscuring their differences. An improved taxonomy of early flight narratives must distinguish between technological and non-technological flights. With these four mandates in mind, we are ready to begin developing a new taxonomy.

A New Taxonomy of Early Flight Narratives

In pursuit of an improved taxonomy of early flight narratives, I determined that a satisfactory theory must meet the four requirements. First, the theory must embrace the complex variety of early flight narratives, without limiting itself to a convenient set of similar texts. Second, the theory must attend to the particularity of flight *qua* flight. Flights are important narrative vehicles, but sometimes they are a narrative end in themselves, not only machinery for ferrying characters between locations. Third, the theory must recognize a multitude of flight technologies. The diverse kinds of flight, real and fictional, pose challenges in considering them all together, but these challenges are not adequately addressed by defining them out of existence. Finally, the theory must distinguish between technological and non-technological flights because these differences strongly indicate the kind of world in which the narrative occurs and the relationship of that flight to that world. These four requirements arise from surveying the existing scholarship and recognizing the different successes and limitations of prior research.

These demands share a central concern: the extreme variety of early flight narratives. Traditional literary categories struggle to make meaningful generalizations about a body of work that cut across genres, various forms, and modes of writing. To analyze this corpus, I adopted a grounded theory approach modeled after the qualitative methods pioneered by social scientists Barney Glaser and Anselm Strauss in *The Discovery of Grounded Theory* (1967). A grounded theory approach particularly suited the problem because, as Kathy Charmaz has argued, the method excels at "creative problem solving and imaginative interpretation," ideally suited to my large literary corpus and dissatisfaction with prior, partial interpretations of that corpus (156). I began with a question, "What does it mean to fly in eighteenth-century literary culture?" and a Venn diagram (not pictured here) describing three of the most significant but most divergent early flight narratives I knew: Francis Godwin's *The Man in the Moone* (1638), Margaret Cavendish's *The Blazing World* (1666), and Robert Paltock's *The Life and Adventures of Peter Wilkins, a Cornish Man* (1751).

My initial Venn diagram and subsequent, expanding iterations constituted open coding, a low-level process of recognizing elements that occurred frequently but not universally within flight narratives, e.g., bird-people, satire, celestial travel, malfunctioning machines, and many other similar descriptive labels. I draw the concepts of "open coding," "axial coding," and "selective coding" from Strauss's research on qualitative analysis *Qualitative Analysis for Social Scientists* (27–33). This analytical method has helped me to synthesize my observations about disparate texts and to generate new ways of thinking about literary texts. Flight was

a significant theme throughout the culture of the long eighteenth century, but its very ubiquity limits the usefulness of traditional literary categories to this analysis. These categories are useful to understanding the narratives, but this flight taxonomy demands a different order of understanding in which those traditional literary categories can exist.

Axial coding—identifying logical connections between codes—led me to concentrate on the abstract qualities that linked different open codes, qualities such as the contrast between machinery and magic or the contrast between a satirical narrative and a narrative without any obvious argument. These axial codes underwent a number of revisions as I considered them against ever-more examples of flight narratives, a grounded-theory process Charmaz describes as "a series of checks and refinements into qualitative inquiry through and iterative process of successive analytic and data collection phases of research, each informed by the other and rendered more theoretical" (156).[15] Finally, I selectively coded the data, identifying logical connections between my most successful axial codes (i.e., categories such as romance and didactic). Additional analysis and data collection refined these logical connections into two overarching questions for understanding the role flight plays in individual flight narratives: (1) dianoia and (2) realism. Consequently, I have named my theory of flight narratives dianoia-realism coordination.

[15] Charmaz summarizes this process by saying, "In short, the grounded theory method emphasizes the process of analysis and the development of theoretical categories, rather than focusing solely on the results of inquiry (156).

Dianoia-realism coordination is a coordinate (two-axis) system that indicates both the overall meaning and purpose of the text (dianoia) as well as the text's relative characterization of flight as either a technological question or an attribute of divine power (realism or the lack thereof). This analytical method encompasses all early flight texts while maintaining enough granularity to theorize about smaller clusters of texts (e.g., the cosmic voyage, balloonomania) as previous research has done. The method can be applied to a single text considered in isolation but works best when positioning texts as part of larger groups and currents of scientific and popular literature. For example, there is little new to be learned from recognizing that Thomas Baldwin's *Airopaidia* (1786) is a scientific treatise on aerostatic ballooning. By recognizing features that *Airopaidia* has in common with aerial fiction, however, we better understand its position within the broader circle of early flight narratives. This understanding allows us to appreciate the historical and cultural meaning of *Airopaidia* without pigeonholing it into a narrow category with little general interest.

The basic action of dianoia-realism coordination is plotting flight narratives on a descriptive coordinate plane. The two axes of the plane are dianoia (intellection-imagination) and realism (divine-technological). That is to say, the first axis charts the primary interest of the flight-related text, whether its overall meaning is chiefly concerned with, broadly speaking, theme or plot. The second axis charts the mode of flight in the text, whether flight is represented as a divine attribute or a technological accomplishment. The purpose of this chapter is firstly to explain these axes and demonstrate their finer grades and secondly to demonstrate

the system's practical application in solving common difficulties in working with the broad body of flight-related works circulating in early modern and eighteenth-century England.

Specific flight narratives will be discussed throughout this chapter, but, most broadly, dianoia-realism coordination illuminates links between texts without establishing rigid boundaries between groups of texts. It is a kind of soft or fuzzy classification, and, the greater precision is sought in classifying the texts, the less reliably different interpreters will agree in that classification. Instead, dianoia-realism coordination gives us a model for articulating affinities between texts and for treating our capacious subject—flight—as a unifying feature of many otherwise diverse pieces of literature. The authors of early flight narratives borrowed enthusiastically from their forebears, and these borrowings did not respect boundaries of form or genre in drawing inspiration and motifs to use in their own creations.

Furthermore, dianoia-realism coordination enables us to recognize the connections and associations that seemed natural during the early modern period. What contextual elements determined the characteristics of flight in a given work? Perhaps most novel, dianoia-realism coordination can reveal gaps that show what seems alien or otherwise underrepresented in eighteenth-century thinking about flight. Why, for example, was the leading book on aviation in 1783 nearing its 150-year anniversary? Did this really indicate that flight was not a subject of interest to eighteenth-century minds or that no scientific progress was made during the

period? How did flight literature change after 1783? These questions and others are addressed by developing a tapestry-like map of early flight narratives.

Fifty Plots Plotted on the Plane of Dianoia and Realism

In the dianoia-realism coordinate system I have described here, the axis of realism refines previous thinking about flight narratives by distinguishing between different mechanisms of flight, including magical means of flight. The axis of dianoia adds a second dimension to acknowledge the wide range of purposes flight serves within literature. The axis of dianoia, combined with the axis of realism, divides flight narratives into four major types (Figure 3) and sixteen subtypes (every possible pairings of degrees between the two axes). Examples of each subtype appear within the body of early modern flight literature, a testament to the variety of these narratives. The historical occurrence of flight narratives, however, is not equally distributed across the sixteen subtypes. When the taxonomic data is arrayed visually, clusters of texts emerge, and these clusters reveal close affiliations between some subtypes as well as noteworthy paucities in certain areas of the recorded literature.

On the next page, Figure 1 shows fifty flight narratives plotted on a coordinate plane, with realism represented by the X-axis and dianoia represented by the Y-axis. For concision and legibility given the large number of data points, the labels designating individual flight narratives have been abbreviated. Beyond the endpoints of each axis, a bold, capitalized label indicates the attribute associated with that end of the axis (e.g., intellection and imagination at respective ends of the axis of dianoia). Tick marks along each axis indicate intermediate degrees between

each extremity (e.g., myth, romance, legend, and history between divinity and technology). The text labels for the tick marks are placed along the right and bottom edges of the chart in order to avoid overlapping with narrative titles. In the four outer corners of the chart, boxes contain labels for the four major quadrants/types of early modern flight narratives (romantic, mimetic, scientific, and Menippean). With the exception of the two central axes, I have omitted gridlines from this diagram in order to deemphasize exactitude and precision in the categorization of individual texts. My earlier definitions of the two axes, their respective degrees, and the four major types of flight narratives indicate the principles that determined each text's position on this visual aid.

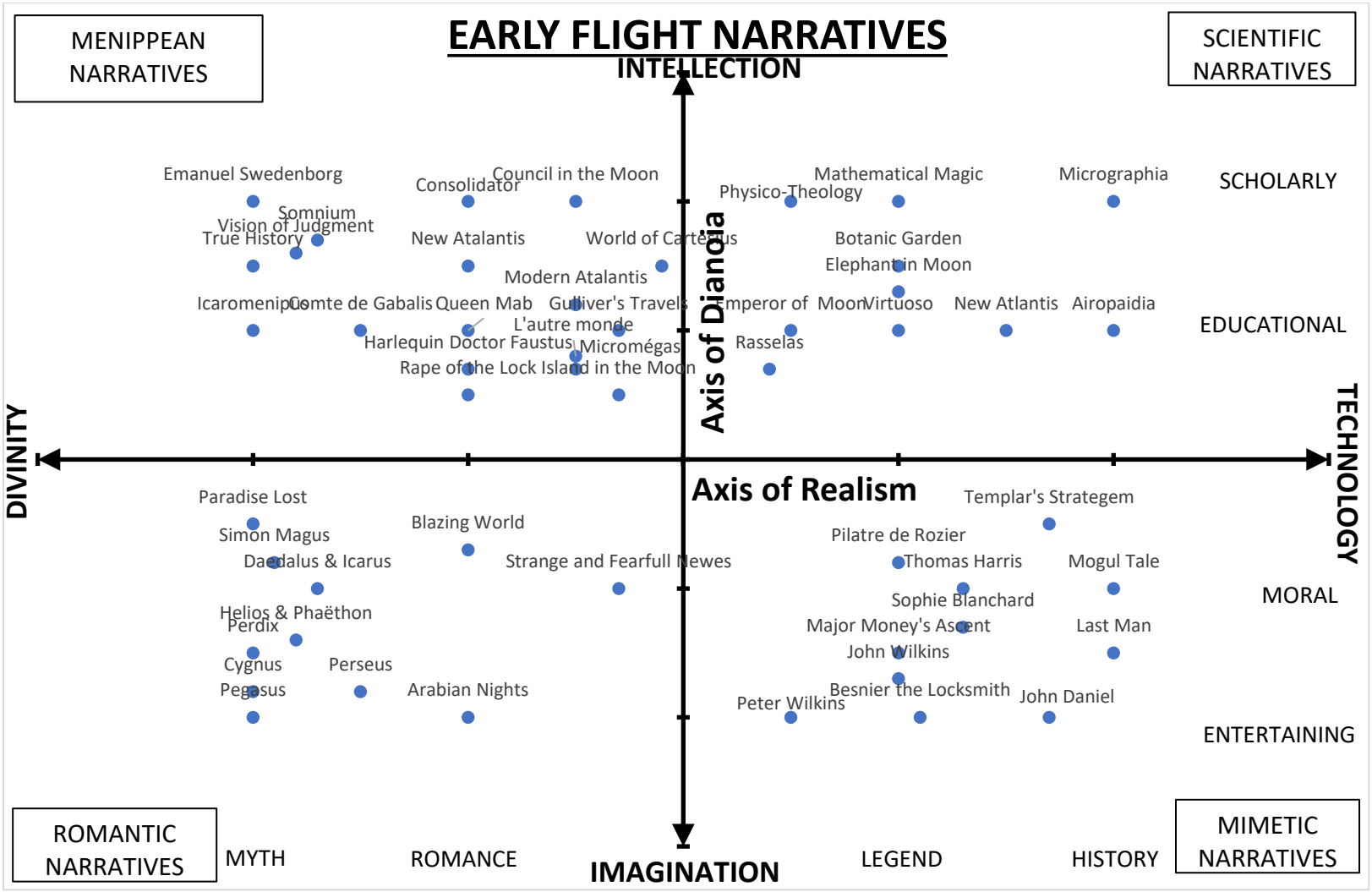


Figure 1 Map of Fifty Early Flight Narratives

Fundamentally, this mapping is a qualitative project, not a quantitative one. The large number of texts involved as well as the coding process is suggestive of distant reading, but I have not here deployed the statistical techniques of corpus linguistics. As a topic of study, flight is not well suited to the application of corpus linguistics. Flight is a large subject with a diverse vocabulary, and building an adequate reference list of flight-signaling terms (bird, hover, Wilkins, etc.) would be extremely time-consuming. Additionally, the many figurative and extended uses of common flight-signaling words would require individual hits in the assembled search results to be manually checked for meaning and context. In eighteenth-century novels, for example, *to fly* almost exclusively means *to flee*, and searching thousands of texts for relevant instances would be a prohibitively difficult undertaking. Instead, I have selected a collection of fifty flight narratives from my own reading, with a preference for those narratives that were especially well-known, influential, or otherwise significant in England during the long eighteenth century. For focus, I have chiefly emphasized English-language narratives, though I have made exceptions for texts, such as Cyrano de Bergerac's *L'Autre monde ou les états et empires de la Lune* (1657), because these texts became prominent in England or otherwise rose to relevant international significance during the period. I have omitted minor references to animal flights that did not involve human flight in a meaningful way as these flights are not relevant to my overall project on human flight and their presence would unmeaningfully warp the data set.

The resultant map visualizes the early discourse of flight as a large, diverse web of interconnected flight narratives. Some familiar, expected clusters include Classical mythology (lower left corner), and a variety of imaginary voyages (chiefly upper left but notably also bleeding over into the scientific quadrant). This perspective alters our understanding of works of flight literature that were traditionally grouped together by juxtaposing these texts with literature that functioned in similar ways but were thought of as something distinct due to differences in genre or form. For example, scientific treatises that discussed the difficulties of producing human flight have surprising similarities to a number of plays, poems, and prose fictions that used flight motifs to satirize the Royal Society. Doubtless, the authors themselves may have taken some offense to the association of their work with the ironic and critical representations of that work; Robert Hooke's diary reveals his deeply personal antipathy to *The Virtuoso*, which he took as a direct satire on his person. I examine this example and other cases of antiaerial writing in my next chapter under the label of antiaerial sentiment. Another grouping that emerges from the assembled data will be recognizable to historians of ballooning, but its literary presence has gone largely unrecognized: the legendary balloonists who met tragic ends in pursuit of their art.

After the development of aerostatic ballooning in 1783, the public was quick to valorize the daring aeronauts who braved the elements to fly. The courage of an aeronaut could become legendary if the flight was fraught with danger and accident. Among literary scholars, the most well-known of these perilous incidents is John

Money's near-drowning at sea during a flight in 1785. The episode was commemorated in articles, poetry, and prints (Illustration 1) commending his extraordinary courage, and the facts seem ideally suited for literature: the dashing young soldier, the slow sinking of the balloon into the sea, the terrible disappointments when ships were spotted on the horizon without a rescue forthcoming.[16] Money survived his elevation to legend, but other ballooning martyrs were typically not so fortunate.

Illustration 1 "The Perilous Situation of Major Money" (c. 1785)

[16] For a detailed account of Money's flight, see Richard Holmes's *Falling Upwards* (6–10). For discussion of George Townshend's poem, the *Poetical Epistle on Major Money's Ascent in a Balloon* (1784), see Siobhan Carroll's *An Empire of Air and Water: Uncolonizable Space in the British Imagination, 1750-1850* (230), and Jessika Wichner's "Hot Air and Chilly Welcomes: Accidental Arrivals with Balloons and Airships in the Eighteenth Century and Beyond" (26-30).

Flight legends never die of non-flight causes within the course of their flight narratives. They may die afterwards and still become legends; Money died of apparently natural causes in 1817 at the age of sixty-five. The novelty of early flight demands a unity of narrative action that prohibits complications. Sophie Blanchard learned aerostation from her husband, Jean-Pierre Blanchard, one of the first famous aeronauts and renowned for being the first to cross the English Channel in a balloon. Monsieur Blanchard's death, however, is little more than a footnote in history despite its curious circumstances; he died of a sudden heart attack while landing his balloon. Madame Blanchard, as she was called, persisted to become the first solo professional female balloonist. Celebrated by both Napoleon Bonaparte and Louis XVIII, Blanchard died as a direct consequence of her flight when her hydrogen balloon caught fire while she was performing a fireworks exhibition over Paris. Consequently, her small monument in Paris depicts her balloon engulfed in flames while the inscription reads "*Victime de son Art et de son Intrépidité*" [Victim of her Art and of her Fearlessness] and she is remembered in the writings of Charles Dickens, Jules Verne, and Fyodor Dostoevsky.

No balloonist, however, ascended higher into the pantheon of scientific heroes than did Jean-François Pilâtre de Rozier. One of the two first aeronauts to fly in a balloon, he was also aerostation's first tragedy when he later died while attempting to cross the English Channel in 1785. Surprisingly, de Rozier, a Frenchman attempting to cross the Channel, one of the chief anxieties of a British culture that feared a French invasion by air, was practically deified in England.

Because de Rozier was the first casualty of the balloon in the fevered first days of balloonomania, the novelty of the technology seems to have overridden a more politicized interpretation of his death. The Mongolfier brothers invented the aerostatic balloon, but de Rozier became the Icarus to their Daedalus, and Erasmus Darwin eulogized him in verse:

> Where were ye, Sylphs! When on the ethereal main
> Young Rosiere launch'd, and call'd your aid in vain?
> . . .
> So erst with melting wax and loosen'd strings
> Sunk hapless Icarus on unfaithful wings;
> His scatter'd plumage danced upon the wave,
> And sorrowing mermaids deck'd his watery grave. (57–58)

Darwin's mythic imagery and heroic verse contribute to the elevation of the fallen aeronaut. As in the case of many real-life figures who receive such apotheosis, less central facts could be adjusted to better tell the tale. De Rozier's less famous companion, Pierre Romain, also died in the crash, but the legend seems to have only room for one hero: Romain is largely absent from memorials to the accident. The reception of these flights suggests the powerful influence that tradition exerted to shape which flights were remembered and how they were remembered. Flight narratives based on real events operate in the same realms as purely fictional flights. We should read other accounts of balloon flights with a similar eye to

context, and we will discover new ways of thinking about the texts. One such narrative is the educational flight history *Airopaidia*.

One of the first significant tomes of post-balloon flight is Thomas Baldwin's *Airopaidia*, which is firstly "the Narrative of a Balloon Excursion from Chester, the eighth of September, 1785," and secondly a treatise on the technology that made the balloon journey possible. The work's striking illustrations include hand-colored maps and foldout illustrations go beyond plain scientific description. Illustration 2 and Illustration 3 on the following pages allow readers to envision that they are placed with Baldwin inside the balloon basket.[17] The reader's deep, sensory engagement with these images is important to Baldwin; he includes detailed instructions for viewing each image for producing the most vivid experience, giving such advice as

> *The Circular View* is seen to the best Advantage, when placed *flat* on a Table or Chair, and *rather* in the Shade: the Eye looking *directly down upon the Picture*" and "Whoever will be at the Trouble of viewing *distinct* Parts of *the Balloon-Prospect*, throu' a very small Opening, made by rolling a Sheet of Paper into the Form of a hollow Tube, and applying it close to either Eye, at the same Time shutting the other; or by looking throu' the Hand, held a little open, and close to the Eye; may form a very accurate Idea of the Manner, in

[17] Illustration 2 is an unnumbered insert between pages 58 and 59. Illustration 3 is an unnumbered insert between pages 154 and 155.

which the *Prospect below* was represented *gradually in Succession*, to the Aironaut; whose Sight was bounded by a Circularity of Vapour. (V)

Baldwin's writing adopts a scientific quality as he provides readers with technical instructions for crafting an instrument necessary for recreating Baldwin's view, but, unlike a telescope or microscope, this technique draws the viewers' eyes through a paper tube and into an image-world rather than the real world. Unnecessary to the intellectional understanding of Baldwin's account, these images amplify the readers' sensual pleasure in imagining that they have joined Baldwin for his marvelous journey through the air.

Illustration 2 "A View from the Balloon at its Greatest Elevation" (1786)

Illustration 3 "A Balloon Prospect from Above the Clouds" (1786)

In the history of criticism, didacticism has a bad name, suggesting a bitter pill of useful but forced education that is at best sweetened with some surrounding story to lure the reader through the lessons. Edgar Allan Poe claimed that "the heresy of *The Didactic*" "may be said to have accomplished more in the corruption of our Poetical Literature than all its other enemies combined" (1), and, in my later chapter on cosmic voyages, I discuss the avowed distaste Percy Bysshe Shelley bore for the didactic even as he wrote the didactic poem *Queen Mab* (1813). In *Airopaidia*, however, Baldwin models a more congenial way of thinking about educational literature, wherein the author values the story for its own account, neither competing with the work's lessons for the reader's attention nor existing as a reluctant addition to the lessons. In the first chapter of *Airopaidia*, Baldwin explains that he publishes his detailed account of his balloon voyage to educate the reader in both the science of aerostation and in its aesthetic qualities. He laments that previous

> Balloon-Voyagers have likewise been particularly defective in their Descriptions of aerial Scenes and Prospects: those Scenes of majestic Grandeur which the unnumbered Volumes of encircling Clouds, in most fantastic Forms and various Hues, beyond Conception glowing and transparent, portray to a Spectator placed as in a Center of the Blue Serene above them: contemplating at the same Instant, and apparently at some Miles Distance immediately below, a most exquisite and ever-varying Miniature of the little

> Works of Man, heightened by the supreme Pencil of Nature, inimitably elegant, and in her highest Colouring.
>
> Such are the Scenes which, Ballooners all allow, constitute the true Sublime and Beautiful: inspire Ideas of rational Humiliation to a thinking Mind, and raise the most careless Mortal to an unknown Degree of enthusiastic Rapture and Pleasure. (2–3)

Through his vivid, narrative descriptions of the balloon journey and through the images that accompany the text, Baldwin makes sensible his extensive tables of barometric data and other measurements taken during his flight.

For Baldwin, philosophical and aesthetic truth come together in the balloon, and no balloonist can fly without being moved both intellectually as well as emotionally. No single perspective or piece of information can create this phenomenon in a reader, and so *Airopaidia* combines a multitude of entrances into the science and the experience of ballooning. Illustration 4 shows an imaginary vantage point not possessed by the author-narrator of the excursion, a view positioned somewhere between heaven and earth, looking down on the winding road and the trees that spot the landscape yet positioned beneath the cliff towering over the village of Helsby.[18] Higher still, above the town, the cliff, and even above the normal margin of the page, the tiny spot of the balloon hangs between two colossal cloud formations. The natural beauty of the landscape throws into relief the sublime height of the balloon, and this spectacle engages a reader's sensibility while

[18] Illustration 4 is an unnumbered insert between pages 77 and 78.

Baldwin's numbers engage a reader's reason. The image could suitably illustrate a novel, and indeed Baldwin's account is written in the third-person perspective. Like the illustrator, Baldwin the narrator stands outside the world and action of his story, even though it is a true story based, as the work's lengthy full title indicates, on painstaking "Minutes made During the Voyage." More than just minutes, more than just a chronicle of detailed observations, the *Airopaidia* combines elements of the novel and of the scientific treatise to create a fascinating and educational history of a flight in a balloon.

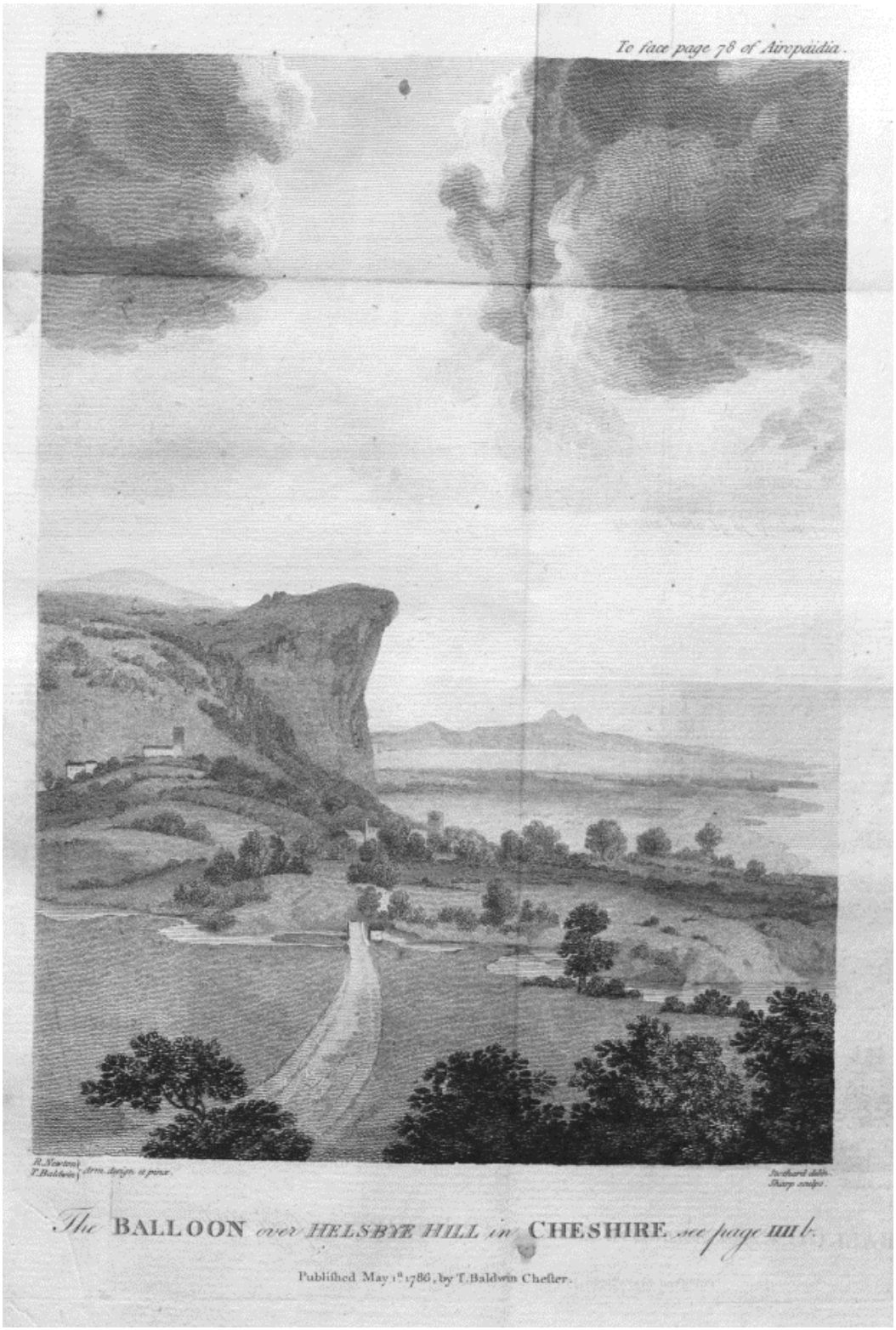


Illustration 4 "The Balloon over Helsbye Hill in Cheshire" (1786)

Reevaluating texts as participants in the dianoia-realism coordinate system can help readers to navigate texts that trouble traditional classification. Like the dazzlingly chimeric author herself, Margaret Cavendish's *The Blazing World* resists easy description. Often called one of the earliest examples of science fiction, the book has also been called a utopian fantasy and an anti-scientific satire. The embryonic state of experimental science at the beginning of the Restoration, Cavendish's complex relationship with the Royal Society, and the text's joint publication with Cavendish's sophisticated philosophical treatise *Observations upon Experimental Philosophy* (1666) all add to the difficulty of incorporating *The Blazing World* into a familiar body of scientific literature. While the book's descriptions of aerial and submarine warfare can seem hauntingly prescient to a twenty-first-century reader, I argue that the book behaves more as an extended moral romance than as a realist novel. The Empress's army consists not of machines but of animal-human hybrid bodies, with the submarines drawn by a navy of fish-men and the aerial bombardments carried out by an air force of bird-men. Although the Empress's hybrid subjects are strikingly well-versed in matters of science, they represent, like Solomon's dominion over the jinn, a unique asset. By contrast, the fictional college of Salomon's House in Francis Bacon's *New Atlantis* (1627) carefully guards the secrets of its flying machines and submarines. Throughout the several worlds of *The Blazing World*, the Empress alone has bird-men subjects, and the narrative does not treat these as technology: reproducible, transferable, universal, scientific.

Animals conceptualized as machines represent a technological challenge to early science. Humans were imagined at the top of nature's hierarchy, but no human could see as far as an eagle, run as fast as a horse, or pull as much as an ox. Instead, humans must rely on technology—telescopes, wheels, levers—to augment their natural abilities and to bring those abilities up to the level of those possessed by the lower animals.[19] In "Writing 'Science Fiction' in the Shadow of War: Bodily Transgressions in Cavendish's *Blazing World*," Holly Faith Nelson and Sharon Alker go even further by reading the bestial hybrid forces of *The Blazing World* in the light of René Descartes's argument that animals were natural machines that lacked the real emotions and sensations experienced by humans. Nelson and Alker argue that the Empress of the Blazing World reduces her hybrid subjects to machines, even calling them "proto-cyborgs—half beast-man, half machine—agents of the state that are used as either war technology or other tools of authority" (119).

I find this cyborg argument unconvincing because it must work extremely hard to make the connection between the Empress's hybrid subjects and the machines they supposedly become. Much of the argument is based on absence; Cavendish does not continue the narrative's early conversations between the Empress and the philosophical societies of the beast-men, so Nelson and Alker presume that the Empress no longer views the beast-men as worthy conversationalists. Militarization becomes mechanization. I would instead argue,

[19] See also Lynn Festa's forthcoming book *Fiction Without Humanity: Person, Animal, Thing in Early Enlightenment Literature and Culture*.

however, that this absence stems from the narrative's own hybridity; Cavendish moves away from discussions of microscopes and astronomy because she has other matters to discuss. The role of the beast-men in the story is diminished, true, but they do not disappear entirely from the narrative, and Cavendish spends hardly less time on them in the latter sections of the book than she does on the characters echoing her real-world husband (the Emperor and the Duke of Newcastle) or the land representing her real-world country (E).

Nelson and Alker rightly point out the strange contradictions of the Blazing World: for example, the world is simultaneously unified and peaceful yet liable to flare into factional strife at the least provocation. Margaret Cavendish is deeply interested in the New Science, but different readers can interpret her as being either positively interested or profoundly antagonistic. Nelson and Alker argue that the author Cavendish has an ironic detachment from her narrative stand-ins (the Empress of the Blazing World and the Duchess of Newcastle) and that the Empress's triumphant conquests demonstrate the devastating consequences that could follow new technology weaponized for the violent partisanship that had been ignited during the English Civil War. In this reading, the reader is expected to imagine casualties among the weaponized beast-men and among the population conquered by the Empress's shock-and-awe campaign against the old world. This interpretation requires, however, providing a great deal that is absent from the text; within the narrative, the Empress's war seems as elegant and beautiful as Empress's own crystal armor and "spear made of white diamond, cut like the tail of a blazing-

star" (133). This is the blazon of romance, not the weaponry of technology. *The Blazing World* is a work of significant sophistication, but it is also the imaginative counterpart of Cavendish's highly intellectional *Observations upon Experimental Philosophy*. We misread the story when we interpret it through the conventions of science fiction rather than through the conventions in which it is written.

I will conclude this section by taking a different approach with my map of fifty flight narratives. Rather than considering what appears on the chart, I ask what does not appear. In this way, I consider what sectors of the map are underrepresented in the body of early flight narratives. What we today would call realistic science fiction is extremely rare in the period, even and especially in the novel. The record contains a few examples—*Peter Wilkins*, *John Daniel*, and Mary Shelley's *The Last Man* (1826) among them. For the most part, however, fantastic machines belong to the Menippean type, where they are idealized rather than realistic. Eighteenth-century thinkers could certainly envision hypothetical future developments in science, but such wonders were also simply relocated in distant lands: in the Orient, in the tropics, or on the moon. Like celestial bodies warping space-time around them, the accumulated masses of these different accepted groups of stories encouraged authors to create within existing frameworks. Continued research in this area might reveal how the distribution of flight narratives shifted over time and thereby explain how different groups of flight literature waxed and waned in prominence while still remaining part of the broader discourse.

At the beginning of this chapter, I noted how varied flight narratives were from one example to the next and how difficult it was to generalize about flight narratives. Grand theories of flight have focused on flight as a symbol—a symbol of humanity's ambition, the exuberance of the imagination, perfected liberty, the divine beyond our reach, and countless others. Flight can represent all of these and more and less. Grappling with my chosen subject has entailed confronting and accepting its polysemy. With this chapter, I offer a map to some of flight's possibilities. Dianoia-realism coordination also offers a model for further applying grounded theory and qualitative research methods to literary studies. Effective coding in grounded theory requires linguistic thoughtfulness, a literary strength honed by scholarly practices such as close reading and attention to discursive webs. Rigorous qualitative methods work in a middle ground between the quantitative, Big-Data approaches of digital humanities methods such as distant reading and the traditional methods of literary history and criticism.

While dianoia-realism coordination is a comprehensive theory of early flight narratives, it is not a complete theory. Clusters of texts on the map and cross-sections of the map have been and continue to be fruitful areas for studying the literary cultures of astronomy, ballooning, and other zones yet to be identified. In my next chapter, I focus on a previously unrecognized assembly of scientific and satiric texts that responded to the seeming impossibility of construction a flying machine in the century before 1783. This antiaerial sentiment emerges from the flight literature unified by a profound skepticism of flight that shaped scientific

exploration before the invention of ballooning and fueled a hostile criticism of a new technology that struggled to achieve the lofty dreams symbolized by flight.

Axis of Dianoia

We might begin equally well with either axis, but the axis of dianoia, while the more conceptually difficult of the two, offers the greatest immediate value to critical interpretation because it speaks to the overall meaning of a work. Dianoia typically denotes thinking that mediates between abstraction and sensation. In Greek philosophy, *διάνοια* (usually translated as *ratio* in Latin) appears in Plato's *Republic*, where Socrates defines dianoia as a level of thinking between belief and understanding. In the analogy of the divided line, dianoia exists on the edge of the visible and the intelligible worlds. Plato's dianoia is mostly concerned with mathematics, but Northrop Frye offers four distinct meanings for the word in the glossary of his *Anatomy of Criticism*, where it is concerned with literary meaning and patterns of interpretation. Varied precise definitions aside, dianoia typically denotes thinking that mediates between abstraction and sensation. For my purposes, the axis of dianoia indicates the degree to which a given work is self-contained or not, how concerned it is with matters interior or exterior to itself. An interiorized work of fiction is generally said to be about its characters and plot. Conversely, an exteriorized work of fiction might seem to have little concern for its characters and plot except inasmuch as they model a system of ideas for a reader, such as an allegory. The dianoia of a strongly interiorized narrative is intellection, while that of a strongly exteriorized narrative is intellection.

Intellection ↔ Imagination

In its broadest definition, intellection means human thinking. In a stricter sense, intellection indicates a mental activity traditionally contrasted with imagination. Intellection deals in abstraction and conceptual reasoning, whereas imagination deals in images, imitations, the mind's faculty that conjures up phantom sense impressions. No thought is purely intellectional or purely imaginative. Intellection without any grounding in sense is unimaginable, while imagination without any ordering reason is unintelligible. That said, thinking may exercise these faculties in varying proportion. On the extremes of the intellection-imagination spectrum, we might imagine biological research on animal communication and a children's toy-book that plays recorded barnyard sounds. One makes no attempt to simulate the reality that gives it purpose, while the other is strongly imitative of that reality without thinking too critically about it. In the realm of early modern flight, we find analogous straightforward examples, e.g., contrasting early scientific writing with pantomime, but other examples caution us against constraining the label "intellection" too narrowly or applying it only to staid nonfiction. Any scholar of allegory will bristle at the suggestion that fiction must inherently be somehow empty of serious or abstract thinking, and so intellection must be recognized on its own grounds.

By imagination I do not mean creativity or originality. In the same way that I do not use intellection as a generic marker of literary quality, I likewise

intend imagination as a technical description of the work's power to create a world all its own, a world of senses rather than of constructed mental abstractions, even though the imagined world has no real presence beyond those sensations imagined in the mind.[20] The narratives of imagination, however, seem to exist for their own sake and for the sake of the characters who inhabit them. These places might share the names of real places (a novel set in London, a play set in the South Sea), but these places are fictionalized. The work only sometimes makes even a limited claim on the reality of the events that unfold within, however much the narrator or introduction may protest that it is a true story.

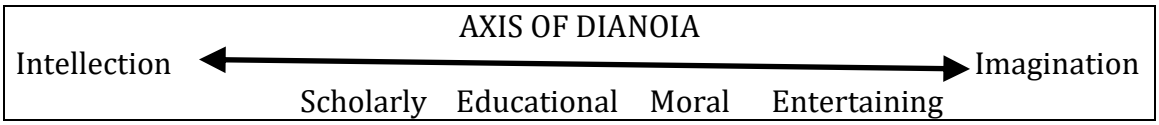


Figure 2 Axis of Dianoia

Along the dianoia axis, I distinguish between four degrees of relative intellection/imagination, shown in Figure 2. Intellection rules scholarly and educational works, while imagination is ascendant in tales of chiefly moral

[20] Cf. the narrative theory concept of *diegesis*, or storyworld, though I have chosen not to use the word here both to limit the amount of Greek jargon and because the word's traditional contrast with *mimesis* may cause confusion later in this essay when I use the term *mimetic* in another sense.

and entertainment value. The choice of these labels as well as the categorization of individual works is largely subjective, and so in the following paragraphs, I will explain my choice of labels and my sense of the meaning of these categories. Others might prefer different terms than mine, such as didactic for educational, with all the attendant slight differences in connotation. Finer divisions within or between my four degrees might be invented, but such an effort at exaggerated precision seems fruitless to me. While these terms I use here would have been understood by early modern authors, they would have interpreted them differently according to their own individual intellectual, cultural, and commercial purposes and deployed a great many overlapping and debatable terms besides. Whatever their other uses, here these terms serve as part of a specific theory of early flight narratives. My goal with these divisions is to draw out the distinction between the modes of imagination and intellection and to demonstrate through example the continuum on which the literature of early flight existed.

Scholarly Literature

At the extreme of intellection, we find those texts with the greatest seriousness of purpose, those texts most interested in communicating with readers about the real world. I have termed this degree *scholarship* for these texts demand the focused study of the reader. Scholarly texts include chiefly philosophical and scientific literature. For example, Robert Hooke's

Micrographia (1665) contains no plot, no fictional characters, and no imaginary world particular to the work. To the contrary, the work has meaning because its world is our world; Hooke enlarges the views seen through his microscope so that readers will join the microscopic world to the world of everyday experience and recognize with difficulty that these two worlds are one in the same. The book's depictions of insect bodies and bits of cork are ultimately unreal, imagined and represented in ink and paper at larger-than-life sizes, but the work becomes largely meaningless and incomprehensible if we try to enjoy it as a work of imagination. Such scholarly works cannot survive divorced from reality as an ever-present frame of reference. Without its close tether to reality, Hooke's book would be a bestiary of fantastic beasts, entertaining but hardly the intended purpose for a publication of the Royal Society. There are narrative examples of strongly intellectional texts, such as Gabriel Daniel's *Voiage du Monde de Descartes* (1690) and Daniel Defoe's *The Consolidator* (1705), and these examples distinguish the categories of intellection and imagination from the similar but imperfectly analogous categories of non-fiction and fiction.

Entertaining Literature

In the extreme opposite direction along the dianoia axis, we have works that take little interest in the world outside their stories. We readers might learn something about the real world by reading these stories because their authors, like us, lived in the real world. Our edification, however, and

indeed our existence is not of primary concern to the logic of the text. Characters within the imaginative world tend to have proper personal names, and, while characters might be highly virtuous or vicious, they do not typically literally embody Virtue or Vice as they might in strict allegory. I have struggled to find a label for the most imaginative texts, those that tell a story without seeming especially invested in whether or not audiences learn something from the experience. *Frivolous* comes to mind, but the word cannot be usefully separated from the implied value judgement against the work's literary merit. For the moment I have settled on entertainment, and works of entertainment stand in sharpest contrast to the opposite works of intellection.

Educational Literature

Between the extremes of scholarship and entertainment are works of more mixed dianoia. Both educational and moral literature possess interests in teaching and pleasing a reader. For this schema, I take educational works as those organized according to a series of lessons but possessing a greater relative emphasis on narrative than do more scholarly works, often but not exclusively written for younger or less educated audiences. Regarding educational literature, literary scholars have most attended to the didactic novel, which Nancy Armstrong has described as "a series of what might be called lessons" that "transform signs of an individual's natural excess into the cultural wisdom of a citizen-subject" (51). J. Paul Hunter notes the

"bewildering variety" of eighteenth-century didactic writing before and during the period traditionally understood as the rise of the novel, and the didactic as a whole exceeds the scope of this section (248). Cecily Hill has argued that didactic literature does not need to consist of "consistent moral lessons" learned by an "exemplar heroine" (732).[21] Hill offers a possible ironic dimension to the learning process of didactic literature, whereby the novel teaches the reader through the contrast of a flawed major character and a cast of prominent minor characters. Whatever the means, lessons are the core principle of educational literature. Educational narratives are usually but not always fictional; the accounts published by the early balloonists are half scientific treatise and half adventure story.

Moral Literature

Lastly, I have declared the degree between educational and entertaining narratives moral narratives because readers of these stories are often left with some concluding moral to take away from the story. A moral tale is less deliberate and less elaborately didactic than an educational one, and more of the story is given over to extraneous details and plot development. In their shortest forms, these moral narratives are commonly fables and parables, and longer stories can include fairy tales or even the

[21] For a fuller discussion of exemplarity in the eighteenth-century novel and especially the use of exemplarity in Enlightenment feminisms, see Eve Tavor Bannet's *The Domestic Revolution* (2000). For exemplarity during the Renaissance, see Timothy Hampton's *Writing from History* (1990). For exemplarity in France and Italy, see John Lyons's *Exemplum* (1989).

biographies of real people, especially when those people demonstrated extraordinary qualities that could be easily abstracted into a characteristic vice or virtue. The traditions of heroism, religious sainthood, and dramatic *hamartia* (the Aristotelian fatal flaw) proved natural models for flight narratives, which by their aerial nature indicated something extraordinary about those individuals who would enact them. This elevation of flight from a mechanical action to a potentially miraculous accomplishment leads to the second axis in my taxonomy of early modern flight narratives: the axis of realism.

Axis of Realism

As a technical term of art and philosophy, *realism* has been used with even greater variety of meaning than dianoia, and the term bears the burden of overwhelming use and strong associations with modernity, the nineteenth-century novel, and derivative, often contradictory terms such as *surrealism* and *magical realism*. The term realism has its detractors; Northrop Frye notes his "distaste for this inept term" (140). Even so, the term's ease of use is undeniable, and I use it in the sense by which it is most readily understood, as an evaluation of how realistic or true-to-life or verisimilar to the real world a flight narrative is.[22] The axis of dianoia

[22] For additional discussion of the term *realism*, its period definitions, and contemporary critique, see Ian Watt's *The Rise of the Novel* (1957), Michael McKeon's *The Origins of the English Novel, 1600–1740* (1987), and Nicholas Paige's "Examples, Samples, Signs: An Artifactual View of Fictionality in the French Novel, 1681–1830" (2017).

concerns the total meaning of a text or its rhetorical purpose, of which the flight is a functional but ultimately constituent part. In contrast, the axis of realism is concerned with the nature of the flight itself regardless of its overall purpose within the narrative. Realistic flight is distinct from plausible flight in the same way that a realistic science fiction story need not restrain itself solely to extant technologies. Before 1783, all flight was a power beyond human ability, but flyers varied considerably in the origins of that power. The question concerned here becomes metaphysical: Does a power of flight derive from natural means or from the supernatural?

Here I am tempted to adopt Frye's distinction between the high mimetic (" A mode of literature in which, as in most epics and tragedies, the central characters are above our own level of power and authority, though within the order of nature and subject to social criticism") and the low mimetic ("A mode of literature in which the characters exhibit a power of action which is roughly on our own level, as in most comedy and realistic fiction") (366). The mingling of power and authority, however, creates complications, and the system of high/low mimesis, largely drawn from Frye's studies in the history of drama, works best with a strong central protagonist who is the chief actor of a narrative. Frye's mimesis is a theory of mode, which he defines as "A conventional power of actions assumed about the chief characters in fictional literature" (366). In many early modern flight narratives, the protagonists simply are not sufficiently active or in control to

receive credit for a meaningful power of action. Instead of focusing on protagonists, the axis of realism frames the power of flight as a product of either technology or divinity.

Divinity ↔ Technology

Protagonists exercise the greatest control over their adventures when their flights are achieved as feats of technology. In the introduction of this chapter, I disagreed with a definition of *flying machine* that excluded balloons, and fictional characters of the eighteenth century soar with the aid of an even wider range of non-character objects (most familiar today, the magic carpet). A systematic survey of such objects, however, can draw distinctions between magical objects and technological objects. The *Oxford English Dictionary* defines *technology* as "[t]he branch of knowledge dealing with the mechanical arts and applied sciences," "[t]he application of such knowledge for practical purposes, esp. in industry, manufacturing, etc.," and "[t]he product of such application." Hence technology is characterized by its mechanical nature and its integration into a system of natural knowledge. Technology is inherently replicable. Given adequate resources and know-how, anyone should be able to construct a flying machine, as indeed hot air and hydrogen balloons quickly spread throughout Europe once the process of manufacturing these machines was understood. The technological flight does not require any unique materials or superhuman abilities.

Before technological flight became commonplace, however, to ascend into the heavens seemed an essentially superhuman action. Flight, so long desired and yet so long beyond the reach of human understanding or ability, has often carried the stamp of the divine. Gods, spirits, witches—their flights signify possession of or at least access to unearthly power beyond the control of ordinary human beings. Likewise, humans blessed with divine gifts of genius (significant plural: genii) or extraordinary materials (e.g., enormous naturally occurring magnets) are also said to have produced flying machines, but their defining singularity explained why flying machines, allegedly invented hundreds or even thousands of years ago, had not multiplied throughout the earth. Even animals, universally recognized as beneath humans in the hierarchy of nature, had been created with a power of flight that had been denied to human beings by Providence. By making flight a divine attribute, storytellers were able to harness its narrative potential (for intellection or for imagination) without committing to a world wherein such flights would inevitably become commonplace.

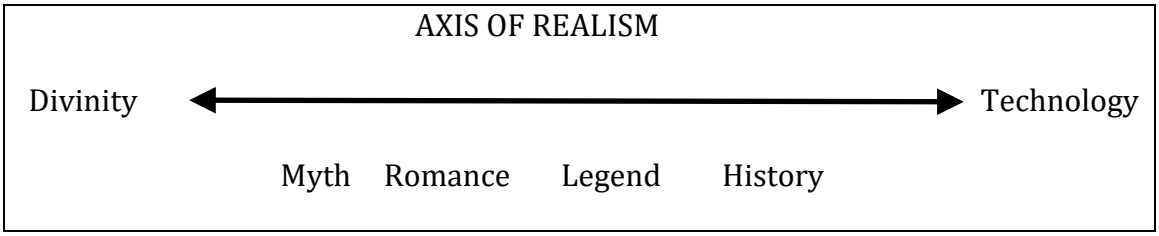


Figure 3 Axis of Realism

Along the realism axis, I distinguish between four degrees of relative divinity/technology, shown in Figure 3. Flight functions as a divine attribute in myth and romance, but flight functions as technology in legend and history. As with the axis of dianoia, the axis of realism is best understood as a continuum rather than as a series of discrete, sharply divided classes. Although *myth* and *legend* have largely agreed upon definitions within the field of folklore studies, the labels are also casually applied to a wide range of narratives, sometimes to praise (a legendary television producer) or condemn (a busted myth). Accordingly, I will explain what I mean when I classify a specific flight narrative as a myth or a legend, and I will identify the typical conventions of flight in these categories. Likewise, for *romance*, I will clarify that I am invoking the medieval and early modern tradition of moderate idealism (heroes who are not gods). The word romance has occasionally served as a term of abuse in the history of literary taste and today most commonly refers to a very different body of popular literature. *History* contains much of what readers today would recognize as realistic science fiction, but this more modern label is a contested one. Scholars today champion their separate favorites—Francis Godwin, Margaret Cavendish, Mary Shelley, Jules Verne—for the prestigious honor of having produced the first acknowledged work of "science fiction." For my purposes here, I am not interested in these labels as self-contained literary categories. Instead, the axis of realism demonstrates the range of possibilities that exist between flight understood as a divine wonder and flight understood as a technological invention.

Flight Myths

A culture's myths are its foundational narratives, those that represent the truths of a culture's idealized world-view instead of reflecting the real world. In *Folk Groups and Folklore Genres*, Elliot Oring locates myths "outside of historical time, before the world came to be as it is today" (124). In *Sacred Narrative: Readings in the Theory of Myth*, Lauri Honko defines a myth as "a story of the gods, a religious account of the beginning of the world, the creation, fundamental events, the exemplary deeds of the gods as a result of which the world, nature and culture were created together with all the parts thereof and given their order" (49). In many cases, the truth of a myth is its representation of the core values of its culture, but it is difficult to identify an educational or moral purpose in the lascivious myth of Leda and the Swan (Zeus in disguise) or the many myths that include the winged horse Pegasus. Today as in the early modern period, however, no myth towers higher over the discourse of flight than that of Daedalus and Icarus.

Although mortal, Daedalus possesses a divine ingenuity that at times threatens the natural superiority of the gods, and his wax-and-feather wings are only one of his inventions that manage to offend the higher powers. Although the substance of the Daedalian wings are universally known, this supposed solution to the problem of human flight is so simple, so obvious, and so insufficient to the real demands of the problem that audiences marvel that the solution could work at all. Anyone might procure wax and feathers,

but only the superhuman, superior cunning of Daedalus could transform these commonplace materials into human flight. Later imitators struggled to bring Daedalus's seemingly technological achievement into reality. All too real, however, were the dangers that later aeronauts faced in attempting to fly, and the tragic death of Icarus remained a prominent touchstone. I discuss the eminence of Daedalus and Icarus at length in Chapter 2 (Mocking Icarus) as I examine the antiaerial sentiment that flourished in early modern scientific thinking.

Flight Histories

While mythic representations of flight remained iconic, the New Science created new possibilities in understanding and reproducing the models of flight found in nature. I use *history* here in the sense of "The facts relating to animals, plants, or other natural objects or phenomena existing on the earth or in a particular region; a systematic account of such facts or description of such objects or phenomena" (*OED*). This is the same sense of the word as it appears in the phrase *natural history* and was used in the titles of many eighteenth-century scientific treatises, including Joseph Priestley's *The History and Present State of Electricity* (1767) and Tiberius Cavallo's *The History and Practice of Aerostation* (1785). The term furthermore has the advantage of applying commonly to fictional texts as well as nonfiction, e.g., the "history of the life and vast variety of fortunes" of *Roxana* (1724) and diverse other secret and allegedly true histories. Flight histories include real-

life accounts written by balloonists as well as wholly fictional but relatively realistic flights narratives such as those found in Robert Paltock's *The Life and Adventures of Peter Wilkins* and Ralph Morris's *A Narrative of the Life and Astonishing Adventres [sic] of John Daniel* (1753). Flight in these narratives springs from explainable, natural, reproducible mechanical powers rather than the powers of deities or geniuses. Some ostensible "histories" are, however, not histories in this specialized sense, including Lucian's mythic *True History* (c. 150 CE) and Cyrano's romantic *L'autre monde* (1657).

Flight Romances

Returning to the flight-as-divine-attribute side of the continuum, romance includes flight narratives that, while not as profoundly idealized as the world of myth, still exist firmly outside the bounds of lived experience. The romance is popular throughout the early modern period and even into the nineteenth century, despite the development of the novel and the advancement of scientific knowledge. A number of cosmic voyages combine natural scientific knowledge with explicit magic: for example, by having a character reach the moon in a flying machine only to discover it inhabited by sorcerers or by having a spirit translate the voyager back to earth after the destruction of his flying machine in a lunar crash landing. Romance is the most populated and most diverse category of early modern flight narratives. The mode affords easy access to the narrative possibilities of flight with minimal commitments to verisimilitude or religion. Classical and foreign

deities appear without anxiety or theological argument. The author can invoke scientific laws or religious traditions, but these invocations can be selective, inconsistent, and suspended at will.

Flight elevates humans above both their fellows and above nature, though in romance flying humans tend to have less direct, personal control over the power of flight than do the heroes of myth. The most famous eighteenth-century flight romance is strangely neglected in eighteenth-century studies: the *Arabian Nights' Entertainment*.[23] Northrop Frye identifies the typical hero of romance as "superior in *degree* to other men and to his environment," someone "whose actions are marvelous but who is himself identified as a human being" (33). This collection contains many of the most famous and mysterious flying objects in literature. Rather than making their own flying machines, characters usually gain the power of flight through chance or through a transfer of authority. Magic carpets fly because they possess a sacred quality through their association with prayer rugs, and the greatest flying carpet of them all, Solomon's carpet expansive enough to carry an entire army, is held aloft by a legion of elemental beings (jinn) rather than intrinsically levitating. Solomon's storied wisdom grants him authority over the jinn through holy signs and ritual magic, invocations of

[23] One important exception to this neglect is the collection *The Arabian Nights in Historical Context* (2008), edited by Saree Makdisi and Felicity Nussbaum. See also other discussions of Oriental influences in the eighteenth century, including Srinivas Aravamudan's *Enlightenment Orientalism: Resisting the Rise of the Novel* (2012).

God's greater authority. Although accidents do occur in flight romances, most often when a human has created a prototype flying machine and flown it into a divine space, the accident serves to grant the character access to a world of superior beings. Romance is a realm of unlikely but fortuitous coincidences.

Flight Legends

Finally, situated along the axis of realism between romance and history, legends are flight narratives alleged to be the true (or at least truthy) stories of real people. According to the folklorist Elliott Oring, legends are "miraculous, uncanny, bizarre, or sometimes embarrassing . . . the improbable within the world of the possible," episodes of individuals who, for good or ill, exceed the normal bounds of lived experience (125). The legend is reality plus a little bit extra, pushing the boundaries of what could be by making marvels of ostensibly real people and places. Readers are not themselves really asked to accept myth or romance as reality; one of most influential myths on early modern flight literature begins with the confession, "[A]s I had nothing true to tell, not having had any adventures of significance, I took to lying . . . Be it understood, then, that I am writing about things which I have neither seen nor had to do with nor learned from others—which, in fact, do not exist at all and, in the nature of things, cannot exist" (Lucian 253). The folklorists Linda Dégh and Andrew Vázsonyi argue that "[t]he legend tells explicitly or implicitly almost without exception that

its message is or was believed *sometime*, by *someone*, *somewhere* . . . [G]eneral reference to belief is an inherent and the most outstanding feature of the folk legend," but this belief does not need to be held by the speaker or the audience (Dégh and Vázsonyi 118). Accordingly, legends, similar to histories, are usually set in a distinct time and place, unlike the clouded indeterminacy characteristic of fairy tales. To allow the exaggeration necessary to a legend, these flight narratives are often set in a faraway era or place, rarely the present.

Flight legends characteristically claim that some otherwise normal character discovered a way to fly. This implies some remarkable but not superhuman talent or ability. If the character only imagines that he possesses such qualities, as does Shadwell's Sir Nicholas Gimcrack and Aphra Behn's Doctor Baliardo, then the narrative is satiric with the tone of irony predominating.[24] The character then becomes legendary after the manner of other monsters and serves as a grotesque warning to others. Even outside of satire, not all flight legends are especially heroic. One such bathetic example is the case of Bladud, a legendary king of the Britons who became famous in the eighteenth century as the founder of Bath. According to Geoffrey of Monmouth, this "very ingenious" man "attempted to fly to the upper region

[24] Real-life inventors, such as the Portuguese priest Bartolomeu de Gusmão and German mystic Melchior Bauer, claimed unique insights into the secret of flight as they sought patronage in European courts. Such claims met with wide skepticism, though, as I discuss in Chapter 3, Gusmão was at least reputed to have achieved some success.

of the air with wings which he had prepared, and fell upon the temple of Apollo, in the city of Trinovantum, where he was dashed to pieces . . . an unhappy fate" (31).[25] Bladud's death dramatizes another feature of these flight narratives: legendary fliers that die within the course of the narrative meet their end as a consequence of their flights. Unlike the heroes of romance, the heroes of flight legends are not superior to their environment. They possess advantages over nature (flight) that are denied to more ordinary characters, but these powers are usually dangerous, unstable, and ultimately a threat to the person who uses them. Flight legends completes the set of four degrees on each axis, which, combined, account for the literature of early flight.

Four Major Types of Flight Narratives

All early flight narratives occupy a place on both the axis of dianoia and the axis of realism. Juxtaposing these axes creates the Cartesian plane of all flight narratives, a manifold indicating the broader narrative function and specific nature of a flight. The intersection of these descriptive values produces four quadrants, the four major types of early flight narratives, which is shown in Figure 4 below. For example, scientific literature comprises flight narratives tending towards intellection and a technological representation of flight, while similar representations that emphasize

[25] Bladud's son and successor Leir is better remembered today as a source for Shakespeare's *King Lear*, though the Bard omits the tale of Lear's fascinating father.

imagination over intellection make up mimetic literature. Considered as a group of narratives, each of the four types possesses distinctive literary qualities and features, which I explicate in the following pages.

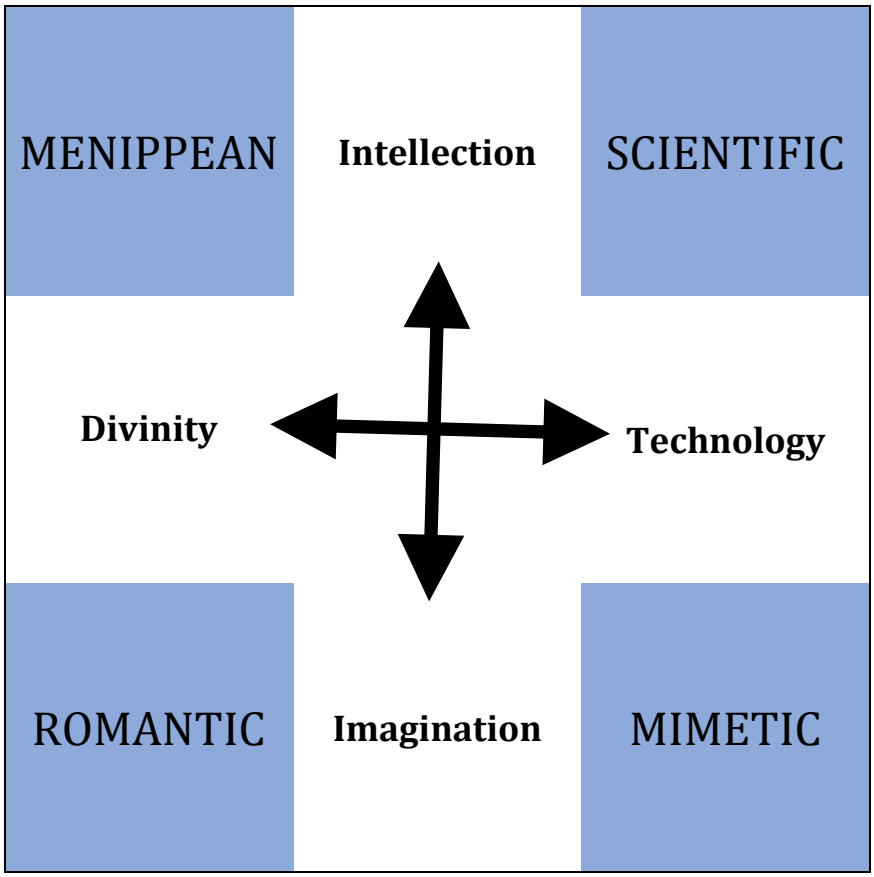


Figure 4 Four Major Types of Flight Narratives

Romantic Flight Narratives

Romantic flights are imaginative and divine. These flights are foundational to early modern thinking about flight and include the earliest

and most widely known sources from Classical mythology. Although largely predating the Romantic movement, romantic flight narratives commonly explore themes later associated with Romanticism: soaring passion, larger-than-life individualism, veneration of nature, and a fascination with the imaginative possibilities of magic and the supernatural. The eighteenth century added a growing body of eastern influences through popular oriental tales, *Arabian Nights' Entertainments* most famous among them. These works injected new motifs into the flight narratives of England, France, and other parts of Western Europe where oriental tales were translated, adapted, and, in some cases, fabricated whole cloth after the style of the imports. Some romantic flights—Icarus, Phaëton, Lucifer—use the literal and narrative arc of a proud flight followed by a fall to represent the catastrophe of hubris. Elsewhere, the flights possess no figurative meaning, especially when the flights in question are the flights of animals or flights enabled by a separate supernatural agent. Scientific advancements throughout the early modern period inspire greater interest in technological flights as time goes on, but romantic flights remained important as a literary treasury of the promises and pitfalls of flight's liberation.

Mimetic Flight Narratives

The mimetic quadrant consists of those flights of the imagination that most directly imitate the real, natural world, without being structured according to lessons or philosophical significance. The history of *mimesis* is

among the most sprawling of all literary terms. In the twentieth century, the term was applied with great variety by many Continental philosophers but most famously in Erich Auerbach's *Mimesis: Dargestellte Wirklichkeit in der abendländischen Literatur* (1953). For naming this quadrant, I emphasize the meaning of mimesis as an imitation of reality as it actually works, not as a figuration that caricatures or directly corresponds to our reality. The mimetic quadrant contains both high and low mimesis as defined by Frye, for this quadrant is marked by a distinct absence of supernatural beings, abilities, or phenomena. Flyers in this quadrant are more or less superior to other humans by virtue of the elevating power of flight (regardless of whether that flight is real or not), but the power of flight is not equated with an essential mastery of nature.

Because no functional flying machines existed before the invention of ballooning, all mimetic flight narratives before and many after 1783 do demand the reader's suspension of disbelief to allow the existence of flying machines. These supposed flying machines, however, strain credibility only a little. They travel along familiar lines of scientific thinking about flying machines and instead only suppose some critical breakthrough in engineering that resolves the mechanical problems that remained unresolved in the real world. Their inventors are in some cases geniuses but in others only fortunate, and flight, once invented, is a power available to all at least in theory. Flight in these narratives, mostly travel novels and rumors

of distant inventors who met with some success, is a firmly human achievement.

Naturally, the mimetic quadrant blossoms after the development of ballooning in 1783. Novels, plays, poems, and prints—balloonomania created a burgeoning marketplace for entertainment about the new, suddenly real technology of flight. Treatises on ballooning proved popular, of course, but they were dwarfed in comparison to the thousands of spectators who turned out to view balloon launches. The older legends of King Bladud, Bishop Wilkins, and Locksmith Besnier were supplanted by living legends, the first men and women who took to the skies. These aeronauts flew sometimes for science but most commonly for acclaim. Their accomplishments circulated in literature, and their ingenuity and courage inspired audiences with a sense of what had been achieved and what might be soon achieved by people not unlike themselves. The Montgolfier brothers, after all, had been paper merchants before they had invented the hot air balloon, and the all-time most celebrated British balloonist was Charles Green, a thirty-six-year-old fruit merchant from Goswell Street in London. Flight had never seemed simultaneously so fantastical and so within reach as it did at the beginning of the nineteenth century.

Scientific Flight Narratives

The scientific quadrant consists of flights characterized by realism and intellection. Among the imaginative flights, the vehicle added color to the

story, but one vehicle might be changed to another without much difficulty; the specific mechanism of flight is less significant than what that flight allows in the narrative. The vehicle matters more in intellectional writing, where individual instances of flying machines bear philosophical significance beyond themselves. For most of the early modern period, realism entails the failure and limitations of human flight, but the reality changed suddenly with the invention of ballooning. Thus, of the four quadrants, the scientific quadrant is most clearly divided into ante- and post-1783 patterns. Early scientific flight literature lends itself especially well to satire as authors used the failures of flight research to debate the developing values of the scientific community.[26] At its most intellectional, scientific literature consists of scholarly writing on the mechanical questions of flight. Before 1783, this scholarly writing was extremely speculative: how one might fly and how that flight might change society. After 1783, authors continued to speculate on possible scientific advancement, but discussion of flight overall became both more extensive and more grounded as increased data developed and restricted what possibilities of flight seemed realistic.

While these writings did receive new attention and relevance after the development of ballooning, the new technology also depended on new knowledge of chemical and material science, and treatises on ballooning demanded considerable technical explanation of how the novel machines

[26] These debates are the subject of Chapter 2.

worked. In many ways, balloons sidestepped the major questions of a scientific tradition that had been focused on the problems of creating a heavier-than-air flying machine. As I explore later in my chapter on wings and balloons, however, the existing scientific literature of flight remained a valued knowledge base for inventors seeking to improve the functionality of primitive balloons.

Menippean Flight Narratives

The Menippean quadrant consists of most early modern literary voyages to the moon, stars, and otherworldly places. While one mimetic novel (Ralph Morris, *A Narrative of the Life and Astonishing Adventures of John Daniel*, 1753) does include an accidental journey to the moon, its portrayal of the moon combines informed speculation about night-day cycles on the moon with unusually reasoned speculation about what kind of people might be discovered on the moon. John Daniel and his son initially mistake their landing place for some unknown, terrestrial country, a mistake that would be unthinkable in Menippean literature. I discuss Menippean literature's origins and early modern uses at greatest length in my later chapter on satire and in my later chapter on cosmic voyages, but the key characteristic of Menippean literature is the otherworldly traveler who discovers an advanced, idealized society. Such a society is often the home of the heroic dead, spiritual beings, or even gods. Menippean travelers make their journeys by many means—magic, extraordinary weather phenomena,

birds, machines. Specific vehicles matter more to Menippean flights than vehicles matter in imaginative flights because the vehicles are part of the intellection of the narrative. Menippean flights are extraordinary events rather than routine accomplishments, and their mechanisms are often supernatural or allegorical rather than literal. Imaginative flight is often merely flight from one place to another; Menippean flight can transverse planes of existence.

Upon arriving in the otherworld, the traveler usually finds an enlightened patron who will teach him the local language (if he does not already speak it by pure coincidence). His tutor will furthermore guide him through the philosophy and politics of the otherworld. A particularly astute protagonist will draw comparisons between the otherworld and his knowledge of Europe, but these comparisons are also often left to the critical thinking of the reader. An ironic element is often present in the observations recorded by the traveler, especially if that traveler hails from a land other than the author's own nation. The most famous lunar traveler of early modern literature was the Spaniard Domingo Gonsales of *The Man in the Moone*. Written by the Englishman Francis Godwin, Gonsales is proudly patriotic and Catholic but must frequently acknowledge the superiority of the English. *The Man in the Moone* ends mysteriously, but Cyrano de Bergerac resumed the tale when his French traveler meets the Spaniard imprisoned as an ape on the moon. (Gonsales explains that he was driven back to the moon

by the Inquisition, a betrayal by his own national religion.) Like Gulliver boasting in the court of Brobdingnag, a Menippean traveler risks exposing the vices and shortcomings of his native country when he invites comparisons between that country and an exemplar country situated in the heavens. Together, Menippean, scientific, mimetic, and romantic narratives form a rich tapestry of early flight. In the next chapter, I turn to the historico-scientific conditions in which the flight narratives of this chapter developed. Although the long eighteenth century was an exciting period in the development of science, early flight narratives rightly suggested that human flight was and would remain an elusive and dangerous desire.

Chapter 2. Mocking Icarus: Antiaerial Sentiment in Science and Satire

On what wings dare he aspire?

What the hand, dare sieze the fire?

—William Blake, "The Tyger"

Much of my research for this project took place during a ten-month fellowship at the Smithsonian Institution in Washington, DC. Surrounded by artifacts of aerial history at the National Air and Space Museum (NASM) and its companion facility the Steven F. Udvar-Hazy Center (UHC), human flight seems self-evidently a grand and worthy enterprise. Touching a piece of lunar rock or standing in the shadow of the Space Shuttle *Discovery* bestows an awesome aura on the space and its collections. I was fortunate that the ending of my fellowship coincided with the fiftieth anniversary of the 1969 Apollo 11 flight that carried humans to the moon for the first time. Today, the Apollo missions are remembered as a landmark moment not only in the twentieth century but in human history. As the event is commemorated in public ceremonies and media retrospectives, a question hangs over the festivities: Why has no one set foot on the moon since the Apollo 17 mission in 1973? Two centuries earlier, the first successful human flight, ballooning,

struggled to persuade skeptics that it was anything more than an expensive and dangerous spectacle.

Even in the 1960s and 1970s, American popular support for NASA programs was tenuous at best and political support for maintaining Cold War-era aerospace funding eroded with the ending of the space race and the beginning of a more cooperative era of the International Space Station. The near-catastrophe of Apollo 13 in 1970 and the destruction of Space Shuttle *Challenger* in 1986 and of Space Shuttle *Columbia* in 2003 demonstrated the danger that failed space missions posed to human life. manned spaceflight became a celebrated extravagance but one with a limited future. This tension, between a fascination with flight and a skepticism towards its value, has a long history that includes not only balloons but also the work of would-be aeronauts a century before humans first took to the sky.

This chapter considers the non-technical but deeply scientific questions of human flight. Was it possible that humans might one day fly, and, if so, how? What would be the benefits of such technology, and who would reap those benefits? What were the dangers of human flight, and who would reap the whirlwind? I argue that these questions coalesced into a wide-spread distrust of flight experiments, and a significant body of scientific and literary thinking firmly opposed human efforts to fly. Human flight posed important philosophical questions, and these questions can be obscured by the commonplace reality and obvious utility of flight in the twenty-first century. Contrary to the fears of early skeptics, flight has not yet destroyed human civilization (though long lines and ever-smaller seating may destroy our

civility). Even so, in this chapter, I defend those early skeptics undone by time. The controversy of human flight does not begin with space travel or with ballooning. Instead, antiaerial sentiment represents the risk of attempting to move, figuratively and literally, up in the world.

Recent histories of ballooning have emphasized the wonder felt by onlookers and aeronauts alike at the first flights of 1783, but this wonder was tempered first by fear of revolutionary technological change and then by disappointment when a vital breakthrough, the ability to steer a balloon, remained stubbornly out of reach.[27] Rather than being wholly new, however, criticism of ballooning echoed an older body of scientific and literary work that firmly opposed human efforts to fly. In the early decades of the Royal Society, this body of writing, which I term antiaerial discourse, presented human flight as a model of dangerous, illegitimate natural philosophy. The early scientific hostility towards flight might seem bizarre to frequent flyers today, but, in this article, I argue that antiaerial sentiment, far from being antiscientific or narrow-minded, rejected flight science because that research was closely associated with charlatanism and worldly ambition. From this skeptical perspective, a would-be Daedalus, such as the comical philosophers of Restoration drama or eighteenth-century fiction, was doomed to become an Icarus, and it was the responsibility of the developing scientific community to keep itself from sharing

27 For wonder and the balloon, see Richard Homes, *The Age of Wonder: How the Romantic Generation Discovered the Beauty and Terror of Science* (2010). For eighteenth-century wonder more widely, see *Sarah Tindal Kareem, Eighteenth-Century Fiction and the Reinvention of Wonder* (2014).

in his inevitable fall. This caution continued even after the balloon launches of 1783 proved that humans could successfully fly. Although much of the early skepticism had assumed the impossibility of human flight, doubts about the wisdom of human flight could not be easily or completely dispelled.

Historians of science recognize flight as one of the most persistent and quixotic goals of early engineering. Taking manned ballooning as a turning point in the invention of flight, Richard Holmes explains that, prior to 1783, the "dream of flight had haunted men—especially poets, satirical writers and impractical fantasists—since the myth of Icarus" (*The Age of Wonder* 125). In his history of flying machines, Clive Hart lists thirty-four would-be aeronauts between 850 B.C.E. and 1660. Jonathan Shechtman refers to "two-thousand-year-old Peruvian legends [that] clearly tell of successful hot-air balloon flights" (21). Nevertheless, scholars today are generally skeptical of ancient astronaut theories and other stories that imagine long-lost flight technology. Accounts of failures are more readily believed, such as medieval monks gliding from towers to break their legs (or worse) on landing. Falling with style is unlikely. Despite the failed, often fatal flights, stories continued to circulate of singular inventors in foreign countries or flying people in distant lands. For many, the myth of Icarus proved as much an enticement to airy ambition as an admonition to grounded humility. Unsurprisingly, therefore, when the new science invigorated mechanical study in seventeenth-century Europe, human flight rapidly rose as a widespread and controversial question for the new machinists.

For this chapter, I will set aside the technical matters of engineering—specifics of wing design and the fluid nature of air. I will return to these concerns in the next chapter, but for now I want to consider the legendary, even mythic nature of flight, and I argue that human flight is a special concern in early science. As arguments about air pumps and the existence of vacuum held metaphysical import as well as physical meaning, interest in human flight exceeded flight's mechanical challenges (and early flight certainly had those challenges in abundance). Debate about human flight tested what early science could have or should have been. In the early days of English experimental science, especially the decades after the founding of the Royal Society in 1660, philosophers asked not only what nature could be but also how experiments could study nature and what kind of natural knowledge was attainable or valid. Through flight, natural philosophers debated what pursuits were possible or permissible within a framework of formal, legitimatized science.

In this chapter, I aim to show that human flight carried a cultural importance far in excess of its material limitations. Although in Chapter 3 I will examine some specific early attempts to build a flying machine, the problem largely remained a mental exercise rather than a site of active experimentation, yet human flight fascinated scientific and literary authors alike. Interwoven with my historical analysis, I will offer new readings of several early satires on the Royal Society. In the next section, I examine Thomas Shadwell's play *The Virtuoso* (1676). From these satires, I argue that, for antiaerial authors, human flight represents a dangerous and illegitimate model of natural philosophy. Antiaerial sentiment condemned self-

elevation as the pursuit of charlatans and social climbers. For the satirists, aerial motifs are not incidental signifiers of science. These motifs mark their bearers as worthy targets of a specific, antiaerial critique.

Historians of aviation emphasize the philosophical and symbolic stature of human flight as a primordial, even elemental, ambition. Philosopher Laurence Goldstein writes that "poets and inventors sought, like the fabulous artificer Daedalus, to alter human nature by craft toward the common goal of privileging air over earth" and suggests that, from an anthropological and folkloric perspective, the desire for flight "may be coeval with the category we call 'human'" (1). Like other primordial yearnings, however, flight remained fascinatingly obvious yet profoundly out of reach. Modern science rightly considers the quests for immortality and eternal youth to be the pseudoscientific realm of quacks and frauds, at least for now, barring numerous and extraordinary breakthroughs in several areas of biology and medicine. Similarly, for many experimentalists at the beginning of the eighteenth century, human flight raised red flags, signaling an enticing promise that demanded extreme skepticism.

Antiaerial Sentiment

Doubts regarding and even passionate opposition to human flight were common among serious philosophers, interested amateurs, and common Britons alike. The Whig Poet Laureate Shadwell satirized the virtuoso as sharply as did his Tory counterparts, which suggests that the battle for scientific legitimacy had greater stakes than partisan influence. Surprisingly, the profound cultural

significance of human flight made it a flashpoint for debating the methods and meaning of the new science. The telescope made possible rapid advances in astronomy that turned minds to worlds above the earth, and improvements in mechanical knowledge and manufacturing challenged the physical and cultural barriers separating human space from outer space. Across the political and scientific spectrum, a skeptical backlash erupted to counter the new speculations. While the prolonged controversy over human flight has largely been forgotten today, I identify an extensive body of scientific and moral writing positioned against human flight. Antiaerial authors varied widely in their reasoning and motivations, but their unified objection to human flight reveals the bizarre movements of early scientific culture.

In an ironic and apocryphal sermon to his famous sons, Milton Wright is said to have declared: "If man were meant to fly, God would have given him wings!"[5] The sentiment seems purposefully, even defiantly, antimodern against the planes, trains, and automobiles that engineers, including the Wright Brothers, introduced to the world in the nineteenth and twentieth centuries. Recently, evolutionary biologist and science historian Stephen Jay Gould popularized the idea of non-overlapping magisteria, in which a disciplinary wall separated questions of natural fact (science) from questions of human values (religion). Although controversial among

[5] The variations in phrasing and attribution of this aphorism appear to be endless as it has become inspirational grist cycled through self-help books, positive-thinking Internet sites, and other sources. Tracing the quotation to satisfaction has proven impossible, but Bishop Wright does seem to have given a congratulatory speech in honor of his sons' achievement at a public celebration in 1909.

creationists as well as many atheists, Gould's distinction does generally reflect the prevailing view that religion has limited bearing on questions of mechanics and aerophysics. The development of experimental science is often recognized as a turning away from theological explanations of nature, but this transition was neither rapid nor universal even within the Royal Society. While strange for many readers today, theology played an important role in the early study of mechanics generally and in studying human flight specifically.

Rarely remembered today alongside Robert Boyle, Robert Hooke, or Isaac Newton, John Wilkins, more than these other members, established the philosophical character of the Royal Society and the long eighteenth century's basic assumptions about human flight. Wilkins committed himself to fostering its growth in a thriving, politically tolerant scientific community, and his wide-ranging scientific writings approach diverse philosophical opinions with a skeptical but open mind. A founding figure of the Royal Society, Wilkins also laid out the long eighteenth century's most enduring basic assumptions about human flight. Keenly interested in experimental philosophy, Within the discourse of human flight, Wilkins's important works are *The Discovery of a World in the Moone* (1638), *A Discourse Concerning a New World & Another Planet* (1641), and, most importantly, *Mathematicall Magick, or, The Wonders That May Be Performed by Mechanical Geometry* (1648). Frequently reprinted through the seventeenth century and compiled into a single volume in 1708, these books explore the cosmological discoveries of Copernicus, Galileo, and Kepler and their philosophical consequences.

In the first two books, Wilkins imagines habitable worlds beyond the earth and considers whether such propositions reasonably agree first with scripture and second with experience (affirmative in both cases). Wilkins goes further in *Mathematicall Magick* to consider how a person might fly to these higher worlds, and his openness to the possibility of human flight made him a fixture of the conversation about human flight for a century to come.

Ironically, later readers of *Mathematicall Magick* ascribed to Wilkins a far more hopeful attitude towards human flight than can be justified by a careful reading of Wilkins's text. Like Daedalus, Wilkins came to represent flight technology in general, detached from his specific arguments on the subject. In the 1717 poem *The Country Life*, John Wren writes:

> Thence to the *Moon*, that next great *Light* on high,
> That *Silver* Lamp, and *Chrystal* of the Sky,
> On winged Thoughts with Learned WILKINS fly,
> The Wonders of that unknown *World* explore,
> And *see* with him Things *in the dark* before. (8)

Long after the first publication of *Mathematicall Magic*, readers still remembered the book's chapter on the art of flying and Wilkins's remarkable claim that flying, like walking, might be learned through practice:

> Those things that seem very difficult and fearfull at the first, may grow very facil after frequent triall and exercise. And therefore he that would effect any thing in this kind must be brought up to the constant practise of it from his

> youth. Trying first onely to use his wings in running on the ground, as an Estrich or tame Geese will doe, touching the earth with his toes; and so by degrees learn to rise higher, till hee shall attain unto skill and confidence. I have heard it from credible testimony, that one of our own Nation hath proceeded so far in this experiment, that he was able by the help of wings in such a running pace to step constantly ten yards at a time. (204–205)

Robert Paltock paid homage to Wilkins with his novel of flying islanders, *Peter Wilkins*, and, while the fictional Wilkins, like his namesake, never learns to fly himself, Paltock presents it as a skill that can be learned even by the children of a fictional island inhabited by a people born with detachable wings. Others, including Shadwell, were less hospitable and acerbically mocked the possibility, lightly suggested by Wilkins, that flight practice was anything more than wasted time and effort. Over the following century, Wilkins became remembered for a naïvely proaerial sentiment, a merrily expectant cheerfulness, that his writing does not in fact contain.

Wilkins's reputation as the preeminent early authority on human flight did him a disservice in the public imagination, whereby any aerial fancy could become plausibly attributed to this famous author. In the early eighteenth century, the *Guardian* published a satirical letter from a correspondent, alias "Daedalus," who boasted of his "considerable Progress in the Art of Flying" (20 Jul. 1713). The Daedalus correspondent of the *Guardian* letter claims to fly, but his ability is as fictional as he is. Instead, this fanciful letter gives the editor an opportunity to

criticize overeager hopes for modernity and progress, beginning with "The famous Bishop Wilkins" who believed that "in the next Age it will be as usual to hear a Man call for his Wings when he is going a Journey, as it is now to call for his Boots." The editor has, however, misattributed this sentiment and mangled its meaning besides. Only in 1935 did the scholar F. P. Wilson identify that this grand claim came not from Wilkins but from the writings of Joseph Glanvill, who was among the most imaginative and speculative members of the early Royal Society (348). In *The Vanity of Dogmatizing* (1661), Glanvill expresses sky-high hopes for scientific progress. He speculates that "To them, that come after us, it may be as ordinary to buy a pair of wings to fly into remotest Regions; as now a pair of Boots to ride a Journey" (182). The *Guardian* quotation replaces the crucial "may be" with the vainly dogmatic "will be." When the early experimental philosophers seem intrigued by the possibilities of flight, readers should take care not to misread their eagerness.

The "Daedalus" correspondent of the *Guardian* letter echoes Glanvill, but this fictitious flyer claims to have achieved flight, while Glanvill had only imagined that humans might one day fly, an important difference. Context reveals that Glanvill chose flight deliberately because human flight seemed impossible, not because it seemed plausible. Glanvill argues that past ages would find telescopes and magnetic compasses "a story more absurd, than the flight of *Daedalus*" (183). Thus, future science might eventually find a solution to flight and other seemingly impossible technologies, such as the elixir of life or an instantaneous network of global communication. Likewise, in context, Wilkins is actually more interested in how a

body might accustom itself to unfamiliar locomotion than in how a child might really fly with sufficient practice.

Wilkins's "credible testimony" story is difficult to identify or defend, but even so Wilkins is neither claiming to have witnessed (let alone practiced) human flight, and the flight he describes is a gliding step, more akin to seven-league boots of Charles Perrault's fairy tales than the winged sandals, *talaria*, of Hermes. Although Wilkins entertains the possibilities of human flight, he is equally well versed in the obstacles and writes at length how neither the arms nor legs of human beings can produce sufficient force to fly with wings. Even a lesser, gliding step requires Wilkins to reassure his reader that his source is credible. *Mathematicall Magick* contains two books: *Archimedes*, a treatise on mechanical invention, and *Daedalus*, a treatise on fabled machines, especially flying machines. The Royal Society regarded human flight with the same distant interest as submarines and ever-burning lamps: all generally unworthy of serious, sustained scientific interest, at least for now. Striking in its absence, human flight finds no home in the *Philosophical Transactions of the Royal Society*. The Society had considered flight and summarily dismissed that avenue for human advancement.

For many members of the Royal Society and of the lay public, the time for human flight might never come, and the loss would have been a mercy. The *Guardian* editor answers Daedalus with a resolve "to prevent any Person from flying in my Time" because "It would fill the World with innumerable Immoralities," as liberated wives and daughters fly to meet their lovers in "a Midnight Assignation

upon the Top of the Monument" or upon "the Cupola of St. Paul's." The choice of architecture is significant; the rebuilt St. Paul's Cathedral had only been officially completed two years earlier in 1711, and the Monument to the Great Fire of London stood on the ground where another church had burned down. The architectural institutions of London after the Great Fire of 1666 would thus be perverted by an even greater destructive force: a rampant, flying sexuality. The author laments that "the whole Air would be full of this kind of *Gibier* [hunted game], as the *French* call it." Appropriately enough, similar national prejudices and sexual anxieties rose again when, later in the century, the English pundits considered the moral threat Continental ballooning posed to English sovereignty and sexual propriety.[28] Furthermore, if winged lovers could escape from the closely guarded home, then winged invaders could enter in. Human flight suggested such a threat to patriarchal social order and legitimate reproduction that some could only trust in God to protect their homes and nation from its ravages.

The fear that human ability might outpace human maturity haunts antiaerial discourse as it shadows technologies as diverse as nuclear power and social media. In 1670 the Italian Jesuit priest Francesco Lana de Terzi (commonly Lana) described a theoretical ship that would be raised into the air by a density-based mechanism

[28] Eighteenth-century British antipathy towards the French is too endless to document, but handsome French and Italian balloonists alike, most famously Vincenzo Lunardi, inspired desire and contempt among English audiences. For sex in balloons and obscene rumors about the French, see Brant 115–122.

similar in concept to the buoyancy of later balloons.[29] Although Lana recognized that construction of such a flying ship would be difficult, he did not believe it to be impossible for physico-mechanical reasons. Instead, Lana believed that Providence itself would prevent the creation of such a machine, at least before humanity was ready for the awesome destructive power flight technology would unleash upon the world:

> Altre difficoltà non vedo che si possano oppore a questa inuentione, toltane una, che a me sembra maggiore di tutte le altre, & è che Dio non sia per mai permettere, che vna tale machina sia per riuscire nella prattica, per impedire molte conseguenze, che perturbarebbero il gouerno ciuile, e politico tra gl'huomini: Impercioche chi non vede, che niuna Città sarebbe sicura dalle sorprese, potendosi ad ogn'hora portar la naue a dirittura sopra la piazza di esse, e lasciatala calare a terra descendere la gente? l'istesso accaderebbe nelle corti delle case priuate; e nelle naui che scorrono il mare, anzi con solo descendere la naue dallaltezza dell'aria, sino alle vele della naue maritima, potrebbe troncarle le funi; & ance senza descendere, con ferri, che dalla naue si gettassero a basso sconuolgere i vascelli, uccider gl'huomini, & incendiare le naui con fuochi artificiati, con palle, e bombe; ne solo le naui, ma le case, i castelli, e le città, con sicurezza di non poter esser offesi quelli, che da vna smisurata altezza le facessero precipitare.

[29] Inspired by seventeenth-century successes with air pumps, Lana's design depended on creating vacuum inside copper spheres instead of filling a flexible bag with gas. I discuss Lana's work in a technical context in Chapter 3.

> [I do not see other difficulties that can oppose this invention except for one, and that is that God might never permit such a machine to succeed in practice in order to prevent many consequences that would disturb the civil and political government among men, for who does not see that no city would be safe from surprises, if it were possible to bring the ship to the top of the square and to let people descend to the ground? The same would happen in the courts of the private houses; and, as for the ships that skim the sea, indeed, with only lowering the ship from the height of the air to the sails of the maritime ship, it could cut the ropes. Even without descending, they could kill the men with irons that they threw down and set fire to the ships with artificial fires, with balls and bombs. From an immense height, they could with certainty fell not only the ships but the houses, the castles, and the cities.] (61)

Today, air supremacy is a major concern in warfare and geopolitics. The news abounds with geopolitical crises created overnight by the testing of a long-range missile or the shooting down of an unmanned drone. In each instance, countries flex their aerial muscles to intimidate their rivals. In the era of early flight, as now, it would be comforting to believe that a greater force would prevent such calamity.

Of all the antiaerial authors, none wrote a fiercer, more sustained attack on human flight than did English clergyman William Derham. In his major work of natural theology, *Physico-Theology* (1714), Derham reads God's intention in "the great Power and Extent of human invention" (276). From a natural theological

perspective, God ordered the world such "that things of great, and absolutely necessary Use, have soon, and easily occured to the Invention of Man; but things of little Use, or very dangerous Use, are rarely and slowly discovered, or still utterly undiscovered" (276–277). Derham reasons that the most dangerous inventions, such as the art of flying, may "always remain, Exercises of the Wit and Invention of Men" (278). Of his examples, Derham speaks at greatest length about flying, and he argues that, whatever good might come of flying, its invention would be catastrophic, perhaps even apocalyptic. According to Derham, neither families nor nations could survive in a world undone by aerial spies and aerial attackers, "and Mankind, instead of cohabitating in Cities, would, like the Eagle, have built their Nests upon Rocks" (279). From a theological perspective, human flight promised not only the individual hazard experienced by Icarus but also worldwide spiritual and social risk.

Derham allows that human moral growth might, in time, permit the discovery of flight, but Derham seems doubtful of this possibility, and his praise for the body as it is, without flight, implies that seeking after a more perfect body is an inappropriate vanity before the final ascent of promised resurrection. In other chapters of *Physico-Theology*, Derham praises God's wisdom in the perfect suitability of human form and motion, and Derham rejects animal bodies, including those of birds specifically, as unsuitable to house human intellect. In other words, the apocryphal sermon of Milton Wright, father of the Wright Brothers: "If man were meant to fly, God would have given him wings!" Such theological reasoning carried

real weight in the scientific thought of the long eighteenth century, and Derham's opposition cannot be bluntly explained as religious sentiment unsettled by the new material science.[30] Like Wilkins and many other prominent members of the Royal Society, Derham was an experimental philosopher as well as a clergyman, and Derham won great respect for his diverse scientific achievements, including the first accurate estimate of the speed of sound through air. Derham's professional stature within the Royal Society demonstrates that natural theology and natural philosophy alike had reason to distrust human flight research.

Four Reasons to Doubt

Early scientific culture commonly considered human flight a model of unworthy, illegitimate science. The myth of Daedalus and Icarus hovered ominously over the discourse of human flight as both classical precedent and as a recurring touchstone. References to the myth appeared in dozens of English-language publications before 1600 and sharply increased to hundreds in the seventeenth century. The word "Daedalian" entered English at this time, when English authors took up the inventor as a symbol of brilliant skill and baffling complexity. While Daedalus was remembered for many inventions, writers only mention Icarus to invoke his pride and subsequent fall, as in the following anonymous moral couplet commemorating Guy Fawkes Night: "Whenonce Ambition doth begin to fly, / Like

[30] Although Derham's position represents the dominant attitude towards early flight research, the German mechanic and mystic Melchior Bauer envisioned the flying machine as humanity's God-given destiny. I discuss Bauer's remarkable cherub wagon concept in Chapter 3.

Icarus, 'twill either mount, or dye" (*Novembris Monstrum* 8). By the end of the seventeenth century, only Archimedes rivaled Daedalus as the archetype for mechanical inventors, and readers were keenly aware of the risks suggested by following too closely in the paths of their classical forebears.[31] While the character of Daedalus celebrated human ingenuity, Daedalian wings, whatever their origin, were an emblem of punished hubris. Daring to fly has a long history as an inappropriate, dangerous, and even impossible ambition. Early scientific culture commonly considered human flight a model of unworthy, illegitimate science. At the beginning of the eighteenth century, human flight was variously seen as impious, dangerous, wasteful, and impossible.

For antiaerialists, the first and most basic problem of human flight was its impiety, a concern even though the Bible has little to say about flight. In Christianity, the air is nonetheless associated with good and evil powers beyond human reach. In the Apocryphal Acts of Peter, Simon Magus uses sorcery to fly until divine intervention causes him to fall and break his leg. Although cherubim and seraphim are depicted as many-winged beings in the Bible, the commonplace association between wings and angels generally is a later artistic development, similar to halos and other conventional iconography that feature visual symbols to represent intangible spiritual meaning. According to the fourth-century Saint John Chrysostom, angel wings are figurative symbols of spiritual elevation rather than

[31] According to legend, the great Archimedes was slain during the Siege of Syracuse (212 B. C. E.) when he provoked a Roman soldier with mathematics instead of being a cooperative prisoner.

literal appendages, and, in Shadwell's day, the influential Bible commentator John Trapp cited Chrystostom to argue that "neither have they [angels] wings," although "The Schoolmen have great disputes about it" (*Epistles* 109). Winged or not, the association of angels with the upper regions suggests a sacred space beyond human ability, and Trapp refers to "riches, and gifts and learning" as "waxen wings," doomed to an Icaran fall (69). In another commentary, Trapp argued that the "voyage towards Heaven" led "through fire and through water" and that none could "go to heaven in a fether-bed" or "fly to heaven with pleasant wings" (*Pentateuch* 42). Destruction awaits the arrogant who seek to rise by their own worldly powers.

Although the Bible does not have an explicit warning against attempting to fly, it does warn against trifling with heights and testing God's patience. In the temptation of Christ, the devil and Jesus have the following exchange:

> Then the devil taketh him up into the holy city, and setteth him on a pinnacle of the temple, And saith unto him, If thou be the Son of God, cast thyself down: for it is written, He shall give his angels charge concerning thee: and in *their* hands they shall bear thee up, lest at any time thou dash thy foot against a stone. Jesus said unto him, It is written again, Thou shalt not tempt the Lord thy God. (King James Bible, Matthew 4:5–7)

An atmosphere of worldly air stands between humanity and the ethereal heavens, and that atmosphere belongs to the devil, who is "the prince of the power of the air" (King James Bible, Ephesians 2:2). In *Paradise Regained* (1671), Milton carries the narrative a step further, causing Satan to stumble "smitten with amazement" at

Jesus's reply, a reminder that the Prince of Air fell from celestial heights (IV:562). Milton creates a strong link between physical elevation and spiritual danger in *Paradise Regained.* Satan carries Jesus to a mountain top to tempt him with the pursuit of "high attempts" of self-glorification,

> the reward
> That sole excites to high attempts the flame
> Of most erected Spirits, most temper'd pure
> Æthereal, who all pleasures else despise,
> All treasures and all gain esteem as dross,
> And dignities and powers, all but the highest (III.25–30)

Jesus replies that true glory is given by God in heaven, not in earthly whispers among unworthy masses. Like disease, like the wind itself, spiritual forces move invisibly but potently through the air.[9] For the patient, Christianity promises eventual, God-given ascent:

> For the Lord himself shall descend from heaven with a shout, with the voice of the archangel, and with the trump of God: and the dead in Christ shall rise first: Then we which are alive and remain shall be caught up together with them in the clouds, to meet the Lord in the air: and so shall we ever be with the Lord. (King James Bible, 1 Thessalonians 4:16–17)

[9] Indeed, Robert Boyle, FRS, only grew more distrusting after he discovered the gas law that bears his name. In 1674 Boyle published a tract on his "Suspicions about some Hidden Qualities of the Air," speculating that occult chemical forces filled the atmosphere when the earth and stars interacted with the air.

In this eschatology, the air represents a supernatural meeting place that demands divine authorization, which cannot be invented or purchased. Again, the Bible does not forbid flight, but outright proscription is unnecessary. For many in the eighteenth century, flight belongs simply to the realm of the miraculous. Without divine authorization, human flight indicates a reckless self-elevation incompatible with Christian humility.

The second problem of flight research was its tendency towards catastrophe. Disaster after disaster confirmed the high price of proudly intruding into heavenly space. Historian Clive Hart's index of early flight attempts is a catalog of unseemly deaths and injuries, recording complete failures such as "Fell on to the Temple of Apollo and was killed" and "He had planned to fly a furlong from a high tower but fell immediately to the base" (196–197). Even partially successful gliding (controlled falling) commonly yields only horrifying results, a litany of maimed arms, legs, and other body parts, as gliders find themselves unable to land or crashing into wells, drains, and rooftops. Hart's index is a testament to human ingenuity and violent disappointment that must be read to be appreciated. Hart records one 1650 German example of "Wings made of iron and feathers" that particularly illuminates why early observers approached human flight with deeply ingrained skepticism:

> Dissuaded from flying from a tower, he flew instead from a low roof on to a bridged covered with mattresses. He broke the bridge, killing some hens

> nesting under it. Later he took his wings to Oberhausen and chopped them to pieces. (202)

Human flight research promised fame and fortune, and records of early attempts to fly reveal that, for many over the centuries, the temptation could overpower even the instinctual terror of dangerous heights. Most would-be followers of Daedalus, however, turned their creativity to projects that let them keep their feet planted firmly on the ground.

The third antiaerial concern was that, in addition to spiritual and bodily danger, even the nonlethal failures of flight research cost time and money, and the improper enterprise carried suggestions of charlatanism and obsession. Claiming to succeed where many others have failed naturally raises doubts, and flight research, like making a philosopher's stone, could leave a wealthy benefactor with prolonged expenditures and little gain for the costs. Hart records the failures of "A Polish peasant" who in 1680 "was obliged to refund subsidies he had received; he was also severely beaten" (204).[32] All experimental philosophy required equipment and financial support, but human flight research became especially costly as the challenges of winged flight became better understood. The Royal Society identified early on that, in comparison to birds, human muscles were likely far too underdeveloped relative to the body weight that they endeavored to sustain. Mechanical solutions to this problem multiplied in the eighteenth century, yielding a

[32] Late in the eighteenth century, balloonists had to defend themselves against the violence of impatient crowds if weather conditions or technical error forced them to cancel their advertised balloon launches.

dizzying array of bird-shaped vessels, winged chariots, and other large, mechanically sophisticated, expensive contraptions. None succeeded.

The fourth antiaerial concern, beyond spiritual, bodily, and financial risk, was that early modern natural philosophy had good reason to believe human flight to be logically impossible. This logic seems absurd to the modern reader, who is confronted daily with evidence to the contrary, but early would-be flyers suffered the embarrassment of failing where the lowest winged vermin could succeed, e.g., flies born in rotten food. Nature testified that some animals could fly, even large animals such as eagles, but winged flight for humanity remained elusive. Aristotelian tradition viewed avian flight as inherent to birds and possibly inimitable; birds had bodies meant to fly, and birds belonged to the atmosphere. The inherent lightness of birds, a metaphysical quality rather than a physical measurement of weight, enabled birds to remain aloft.

Humans, on the other hand, belonged to the earth and had bodies to transverse the earth, not the air. If natural logic excluded humans from the category of flying things, little could be done to alter the fact. In the long eighteenth century, experimental philosophy offered more hope by framing flight as a problem of mechanics, which could in theory be improved upon. Despite countless observations, careful dissections, and competing theories, however, bird flight remained a great, stubborn mystery. The available evidence, observations on the great size and power of bird wings relative to their bodies made the problem seem

all the more insurmountable. Even bulky bumblebees could fly, but flying machines painstakingly designed after animal proportions failed all the same.

For these reasons and more, flight modeled an unworthy and illegitimate pursuit for human inquiry. Classical and Christian mythology as well as common sense dictated that research into human flight was a doomed proposition from the start. Experimental evidence agreed with the cultural norms. To choose to pursue human flight, therefore, in spite of all cultural and scientific urging to the contrary, signified a profound defect in the character of the would-be flyer. Prior to the invention of the aerostatic balloon, a would-be aeronaut was commonly a philosopher who had left the path of reason to chase after self-indulgent fantasies. A skeptical chemist such as Boyle might write about the philosopher's stone, but he would not stake his reputation on transmuting lead into gold. Likewise, skeptical machinists might speculate about human flight without taking the bait.

Arrogance, fraud, or simply poor judgment—personal flaws explained the perverse impulse to fly far better than individual genius or reasonable belief in a scientific breakthrough. A skeptic might reasonably resign flight to the category of junk science, where we now place such dead-ends as cold fusion and the perpetual motion machine. Today, many national patent offices, tired of reviewing patent nonsense, have implemented policies that refuse to consider perpetual motion machines, which remain a common subject of conspiracy theories on the Internet. In *Perpetuum Mobile: Or, A History of the Search for Self-Motive Power from the 13th to the 19th Century* (1870), the exasperated engineer Henry Dircks wrote:

> There is something lamentable, degrading, and almost insane in pursuing the visionary schemes of past ages with dogged determination, in paths of learning which have been investigated by superior minds, and with which such adventurous persons are totally unacquainted. The history of Perpetual Motion is a history of the fool-hardiness of either half-learned, or totally ignorant persons. (354)

Dircks continues in this vein for many pages, yet, a hundred and fifty years later, the quixotic quest for free energy continues. Dircks's vitriol expresses the frustration antiaerial authors reserved for naïve speculations on human flight. The art of flying represented a branch of scientific inquiry as disreputable as the baser forms of alchemy, with all its popular connotations of worldly avarice and charlatanism.[33]

By the Restoration, human flight research had proven itself costly, dangerous, and an unreliable investment for philosophers pursuing the useful arts celebrated in the Royal Society's charter. To criticize human flight research is to criticize a corruption of legitimate science, and satirists use aerial motifs to demonstrate specific ways in which the virtuosi have gone astray in their work. When we take references to human flight as not merely incidental details but also as important signifiers, familiar texts begin to resonate in new and unexpected ways. By reading *The Virtuoso* in this light and alongside *The Emperor of the Moon*, I wish to draw new attention to Shadwell and Behn as scientific critics in their own right as

[33] In Chapter 3, I discuss the adoption of ballooning by stage magicians such as Gustavus Katterfelto, whose trade suffered a not wholly undeserved reputation for ignorant quackery and deliberate fraud.

well as guides for reinterpreting Swift's satire in Part III of *Gulliver's Travels*. Far from ignorantly mocking science they do not understand, the antiaerial satirists thrust themselves into a sophisticated discussion of the aims and character of the new natural philosophy.

Coxcomb *Virtuoso*

Like many other Restoration comedies, Thomas Shadwell's *The Virtuoso* presents the romantic triumph of two young "Gentlemen of wit and sense" over the opposition of an envious and jealous coxcomb (a foolish, conceited man), but this coxcomb is obsessed with gaining fame as a natural philosopher. The self-declared virtuoso Sir Nicholas Gimcrack seeks to use his scientific accomplishments to impress two young gentlemen who are themselves only interested in the nieces of the would-be savant. The suitors pretend amazement, but they and the audience laugh at Sir Nicholas's gross affectations, his bombastic speeches, and his absurd laboratory. Over the course of the play, Sir Nicholas neglects his social responsibilities and ultimately comes to ruin without impressing anyone or achieving any form of scientific greatness. Sir Nicholas's obsessions reveal not only the inappropriateness of his desires but also his total inadequacy in pursuing those desires.

Although popular in its own day, *The Virtuoso* has received only erratic critical attention among scholars of literature and historians of science. Early twentieth-century writing on *The Virtuoso* took an uncharitable view of the play's satire. Early critics drew parallels between the scientific trappings of the play and

contemporary scientific experiments, but these critics take the play only as a generalized satire on science. Sympathetic to the natural philosophers, Albert S. Borgman lamented in 1928 that the play preyed on experiments that "could easily impress a person of non-scientific mind, particularly if he was on the hunt for subjects inviting satire, as puerile or useless" (165). F. P. Wilson continued this trend with a 1935 article that presented a heroic, rising Royal Society embattled by satirists like Shadwell. In preparing the *Regents Restoration Drama* edition of the play in 1969, Marjorie Nicolson and David Stuart Rodes took a more neutral stance towards the play's satire, cataloging but not judging its choice of targets. Although these scholars did invaluable work identifying the specific connections between the play and the Royal Society, critics in more recent decades have taken greater interest in the methods and aims of Shadwell's satire.

Rather than a generalized indictment of science, Shadwell offers a caricature of a certain type of would-be philosopher, the kind of philosopher who would squander resources on the disreputable art of flying. Joseph M. Gilde changed the current of *The Virtuoso*'s critical reception when he declared in 1970 that "The primary target of satire in *The Virtuoso* is not—as previous commentators have supposed—the experimental scientists of the Royal Society" (469). Gilde focused on the rhetorical devices of the play's fops, and Gilde contrasted the language of these affected fools with the plain style advocated by Thomas Sprat and other members of the Royal Society. Subsequently a surge of new scholarship addressed the play's relationship with Puritan rhetoric (Maddux, 2007), class (Chico, 2008), and

laboratory theatrics (Shanahan, 2009). In my new reading, I argue that antiaerial sentiment is a major theme of the play, and I emphasize the active role Shadwell takes when he invokes the play's aerial motifs for the purpose of satire. Far from just the trappings of science, the play's aerial motifs allow *The Virtuoso* to debate the values of scientific inquiry. Shadwell, like Behn and Swift after him, satirizes science in order to shape its development.

An attack on one kind of science is not necessarily an attack on all kinds of science, and likewise attacks on the virtuoso should not be misconstrued as attacks on the Royal Society at large. The *Oxford English Dictionary* notes that the word "virtuoso" can specifically indicate "a member of the Royal Society" and can imply "only superficial interest or knowledge." Although "virtuoso" is strongly associated with the Royal Society, the word is recorded in English a half century before the founding of the Royal Society, and, throughout the eighteenth century, the word suggested antiquarian as well as scientific dilettantism. "Virtuoso" rarely appears in English as anything but sarcastic praise, and Restoration satire is caustic in its specificity.

To satirize scientific debasement and the vices that drive it, Shadwell links Sir Nicholas's desperate, unphilosophical pursuit of worldly honors to a passion for flight. When Bruce and Longvil pretend to be virtuosi and first meet Sir Nicholas, their host immediately strives to impress his guests with his great scientific achievement. Sir Nicholas boasts that he is "so much advanc'd in the art of flying that I can already outfly that ponderous animal call'd a bustard, nor should any

greyhound in England catch me in the calmest day before I get upon the wing" (44-45). In this flailing bid for admiration, Sir Nicholas makes a strange claim that has received no sustained scholarly attention. This boast, however, carried far greater meaning for Restoration audiences than has been recognized by modern readers. Sir Nicholas is betrayed by his own language when he compares himself to a bustard, a large bird whose English name derives from its Classical Latin name, *avis tarda*, which translates as "sluggish bird." A fuller understanding of "bustard" turns Sir Nicholas's boast into unwitting self-humiliation. A poor flier, the bustard confirms that the audience should have little faith in Sir Nicholas's abilities, but the bustard is also emblematic of Sir Nicholas's deep faults and disordered mind. For historical-cultural reasons, audiences should worry that Sir Nicholas willingly links himself with this particular deeply ignoble bird.

Audiences cannot believe for a moment that Sir Nicholas can fly any more than they can believe Sir Nicholas can learn to swim without getting wet. He observes the movements of a frog and practices his swimming upon a table, hating water and intending to "never come upon the water" (46). Hilariously, Sir Nicholas claims that "To study for use is base and mercenary, below the serene and quiet temper of a sedate philosopher" (47). Sir Nicholas understands knowledge first and foremost through a class hierarchy. Sir Nicholas observes a real-world distinction—the gentlemanly cultivation of the liberal arts as opposed to the specialized, practical technology of the tradesman—and then self-consciously constructs his identity around this distinction. Sir Nicholas's knowledge is purely, unnaturally, and

deliberately theoretical. Sir Nicholas boasts of his swimming studies as readily as he boasts of his understanding of flight, but Sir Nicholas is neither a frog nor a bird. Moreover, Sir Nicholas shows how little he understands of his own professed objects of study. Sir Nicholas chooses a bustard as his standard for comparison, but the irony of this choice eludes him, unnoticed.

Sir Nicholas cannot fly any more than he can swim; he does not understand the difference between believing he understands how to do something and having actually performed the deed. In *Micrographia* (1665), Hooke argued that the basic problem of human flight was simple and well-understood, albeit unsolved: "The way of flying in the Air seems principally unpracticable, by reason of the want of strength in humane muscles; if therefore that could be suppli'd, it were, I think, easie to make twenty contrivances to perform the office of Wings." Hooke, of course, could never develop one flying contrivance, let alone twenty, and the much later development of the 1903 Wright Flyer proved that heavier-than-air flight required more than a powerful engine. Modern powered flight shows that Hooke was generally correct—human limbs cannot supply adequate force to sustain human flight—but his careless, even flippant commentary on the problem foreshadows Sir Nicholas's overconfidence before an unsolved problem.

The bustard represents a comically limited rival to Sir Nicholas; rather than besting the bustard, he has become one himself. In Aesop's fable of "Bustards and Cranes," the light, agile cranes escape hunters, while the "Fat, and Heavy" bustards are taken (L'Estrange 191). The bustard is not merely a large, unwieldy bird but a

suitable emblem figuring Sir Nicholas's enormous failings as a philosopher. A common, easily captured game bird, the bustard was later hunted to extinction in England in the nineteenth century, much as Sir Nicholas himself ends the play in ruin. Sir Nicholas as a gentleman-philosopher, should know better than to associate himself with the bird.[34] Although Sir Nicholas claims he could escape a greyhound, his confidence is more foolishness. In his 1660 commentary upon Ecclesiastes, John Trapp wrote that "Fools many times beat their wings much, as if they would fly farre and high, but with the Bustard, they cannot rise above the earth (294). In an earlier 1647 commentary, Trapp had used the bustard as a symbol of pride:

> Aspiring to that heavenly glory, earthly greatnesse is oft times no small impediment. The Bustard or Ostrich can hardly get upon his wings, whereas the lark mounts with ease. Nay, as those that walk on the top of pinnacles are in danger of a precipice, so are great men of greatest ruine. Even heigth it self makes mens brains to swim." (*Epistles* 655)

High on his pride, Sir Nicholas loudly announces that he is an advanced flyer, but audiences can assume his flying is as theoretical and as completely hypothetical as his swimming.

This overconfidence indicates a larger moral problem in Sir Nicholas's judgment, which has been overpowered by his ambition. If Sir Nicholas's only obsession were microscopy, his poor judgment could be the warped product of long,

[34] For the early modern gastronomical reputation of the bustard, see William Ramesey's *Helminthologia* (1668, 177).

concentrated study, but Sir Nicholas is flighty and impatient for success. Sir Nicholas flits from subject to subject and develops no specific expertise. Instead, he dabbles in all things and declares himself a universal master of any discipline to which he turns his mind. This virtuoso wastes his efforts on a general vanity rather than a focused obsession, and his constant boasts expose him as a coxcomb, performing but not being a great and learned man. On limited evidence, Sir Nicholas concludes with outrageous certainty that his abilities are extraordinary.

Even as a game bird, the bustard is an uninspiring creature, and Sir Nicholas squanders what little potential he has on projects such as flight. Trapp continued his commentary on the bustard by observing that, if fools or bustards do manage to fly, "they are soon pulled down again by the Devil, [and they] feed upon the worst of excrements" (294). Trapp allegorized the bustard's scavenging appetites, which were widely known and kept the game bird in low regard and associated the bird with illness and disease. According to William Ramesey, physician to Charles II, the bustard feeds "upon dead flesh, Garbidge, and any trash they find" (177). Ramesey attributes "ill humors" to bustards, which consume corruption and concentrate it in their polluted bodies. Likewise, Sir Nicholas has indiscriminatingly gobbled up scientific knowledge and patent nonsense alike, a fact not lost on the young suitors who pretend to be virtuosi to gain Sir Nicholas's confidence:[3]

BRUCE [*to* Longvil]

[3] In his quest for prestige, Sir Nicholas even imbibes Rosicrucian occultism, a posturing I will later discuss in conjunction with *The Emperor of the Moon*.

Good! How these fools will meet a lie halfway.

LONGVIL [*to* Bruce]

Great liars are always civil in that point. As there is no lie too great for their telling, so there's none too great for their believing. (70)

Sir Nicholas's unrestrained, undiscerning consumption has unbalanced his humors, for his desire to thrive as a virtuoso has left him a diseased imitator rather than a great philosopher.

In interpreting *The Virtuoso*, I have glossed the bustard not merely as a large bird but as an emblem figuring Sir Nicholas's enormous failings as a philosopher. Classical authors contribute one final parallel between Sir Nicholas and the bustard: dangerous imitation. Bustards form the subject of one of the many imagined dialogues written by Athenaeus of Naucratis for his collection *The Deipnosophistae; or, The Banquet of the Learned* (ca. 300 CE), in which renowned philosophers, authors, and other classical luminaries sit down to dinner and talk together. In Book IX, Athenaeus paraphrases the real writings of Aristotle, Plutarch, Alexander of Myndian, and other authorities to describe the habits and nature of bustards: "a great imitator of mankind; and accordingly it is caught by dancing opposite to them … And it is an imitator of whatever man does. On which account the comic poets call those people who are easily taken in by any one whom they chance to meet, a bustard" (615). Sir Nicholas has wasted thousands of pounds on microscopes, bottles of imported air, and other experiments that ape real seventeenth-century

scientific research. Sir Nicholas Gimcrack imitates Hooke and Boyle, but, in the end, the virtuoso is at heart a coxcomb.

The Virtuoso is most commonly studied, celebrated, and pilloried for its portrayal of microscopes. Without a doubt, the play drew from the microscopic and mechanical research of Robert Hooke, and the parallels between Sir Nicholas and Hooke caused the eminent philosopher significant personal embarrassment. In a recent biography of Hooke, historian Allan Chapman, sympathetic to Hooke and at best indifferent to Shadwell, dismisses Shadwell's satire as "scurrilous" and frames Shadwell as a wit overwhelmed by Hooke's scientific achievement: "It is books such as *Micrographia* which open up new realms of wonder to all levels of the human imagination, and Hooke should not have felt too offended when one of these turned out to be the popular stage, as in the case of Shadwell's *Virtuoso* play" (54, 58). In a famous episode frequently noted by biographers and literary scholars alike, Hooke himself, at least, took *The Virtuoso* as a personal attack meant to humiliate him before the public. Upon seeing the play on 2 June 1676, Hooke wrote in his diary: "Damned Doggs. Vindica me Deus. [God help me.] People almost pointed" (*The Diary of Robert Hooke* 235). Hooke's work doubtless contributed to Shadwell's character of Sir Nicholas, but it is now easy to forget how expensive and impractical early microscopes were.

For many, the microscope was perceived not as technological advancement but as a fashionable gimcrack, a showy mechanical contrivance of questionable value. In his article "*Elefanten im Mond: Der prekäre Status des wissenschaftlichen*

Instruments"["Elephants in the Moon: The Precarious Status of Scientific Instruments"] (2004), Thomas Brandstetter argues that Shadwell included a microscope in the scientific arsenal of Sir Nicholas Gimcrack as a scathing but not particularly intellectual lampoon of the famous Hooke. Brandstetter contrasts Shadwell's lampoon with the sophisticated critique of a similar satire, Samuel Butler's short poem "The Elephant in the Moon" (ca. 1670). In the late eighteenth century, microscopes found their way into the magico-technical sideshows of dubious characters such as Katterfelto, who could lecture on balloons on cloudy days ill-suited to his famous microscope. Like balloons after them, microscopes proved themselves successful but not obviously useful.

Oddly neglected in these arguments, however, is the fact that Hooke actually wrote about human flight in *Micrographia* (1665). Hooke argued that the problem was simple and well-understood, albeit unsolved: "The way of flying in the Air seems principally unpracticable, by reason of the want of strength in humane muscles; if therefore that could be suppli'd, it were, I think, easie to make twenty contrivances to perform the office of Wings" (nonpaginated preface). Hooke, of course, never developed one flying contrivance, let alone twenty, and his careless, even flippant commentary on the problem is a scientific failing that Shadwell satirized through the character of Sir Nicholas.

Although *The Virtuoso* is only studied today for its satire of science, its scientific elements should be read as part of a larger project attacking affectation and the desire to be recognized above one's station. The play's prologue and

epilogue name fops and coxcombs–dandies and conceited fools—as the target of the satire. In *The Virtuoso* as in other Restoration and eighteenth century satires, the most contemptible characters are those who pretend to be greater than they are. It is a bad thing to be a dullard but a far worse thing to be a dullard who affects to be otherwise. In the prologue to *The Virtuoso*, Shadwell's mouthpiece marries the new virtuosi to the old Jonsonian theory of humor. The virtuosi are in a sense new to the stage:

> Plenty of fops, grievances of the age,
> Whose nauseous figures ne'er were on a stage.
> [The author, Shadwell] cannot say they'll please you, but they're new;
> And he hopes you will say, he has drawn 'em true. (7)

Yet, while the virtuoso adds novelty to Shadwell's satire, his characters echo the basic human faults of stupidity and cupidity that could be viciously derided in Jonsonian comedy. Shadwell's cast includes a florid orator (Sir Formal Trifle), a would-be wit (Sir Samuel Hearty), and a hypocritical misanthrope (Snarl). *The Virtuoso* is a play about a failed philosopher, one too disconnected from the respectable philosophical community even to understand that the epithet *virtuoso* was not a badge of honor. Shadwell sketches Sir Nicholas's failings as sharply when Sir Nicholas boasts of his flying as when Sir Nicholas boasts of his microscopy. Sir Nicholas aspires to be Daedalus, but his wasteful, isolated pursuits can never get him off the ground.

Typical of a Restoration comedy, hope for the future lies in moderation and youth. Bruce and Longvil are defined on the Dramatis Personae page as "Gentlemen of wit and sense" (8). In the play's first scene, Bruce and Longvil discuss the materialist writings of Lucretius and enjoy their own intellects at the expense of the many pretenders in the town. Their success comes from their balance, for they are neither as ill-educated as Hearty nor as over-educated as Trifle. Although easily able to perform their parts imitating virtuosi, they do not share in Sir Nicholas's ruin at the end of the play, when weavers, glassmakers, and other manufacturers rise up against the threat of new technology and Sir Nicholas is unable to persuade them of the uselessness of his research. Instead, in the hour of need, Bruce and Longvil reveal themselves as capable gentlemen who can behave according to their station. With decisive action, they scatter the rabble crowd before them and, by marriage, wrest away Sir Nicholas's patriarchal authority over his nieces. Ultimately, Sir Nicholas's foil is not a character who rejects science but one who demonstrates a well-regulated sense of science's proportionate place in a balanced life.

Sir Nicholas discovers that neither the art of flying nor the art of microscopy will help him to rise above his natural station, and these distractions have instead kept him from fulfilling his social responsibilities as a gentleman and the master of his house. Sir Nicholas disregards his family and the general public in his deluded quest for scientific stature, and this disregard leaves his country possessions seized by angry manufacturers and his wealthy nieces protected by their new lovers. Despite the losses that his earthly neglect has cost him, however, Sir Nicholas never

can get his head out of the clouds. In the final scene of the play, Sir Nicholas laments that he "should know men no better! I would I had studied mankind instead of spiders and insects," but his repentance does not last, for his last words in the play offer little hope for Sir Nicholas: "Am I deserted by all? Well, now 'tis time to study for use. I will presently find out the philosopher's stone.[4] I had like to have gotten it last year but that I wanted May dew, being a dry season" (139). In a famous illustration by Pieter Bruegel the Elder, an alchemist neglects his decaying house even though it is his own brazen neglect that makes the wanted gold so desperately important. Likewise, the financially ruined Sir Nicholas cannot accept the loss of his gentlemanly leisure, but instead he doubles down on his folly and seeks redemption in a Quixotic quest for scientific greatness. Sir Nicholas lost everything by seeking glory in his mismanaged pursuits, and this vanity convinced him that he could be a Daedalus instead of an Icarus. He can only take what others give and then fall from the shoulders of giants.

The *Emperor* Has No Wings

To an extent, antiaerial sentiment had little to do with the specifics of wings. The seventeenth and eighteenth centuries saw a wide range of experimental flying machines, but the aerostat of 1783 was the first successful flying machine. All flying machines were physically and morally dangerous. In *The Virtuoso*, Sir Nicholas's

[4] The legendary end goal of alchemical work in the Hermetic tradition, the philosopher's stone ideally represented the purification of spiritual substance. That the stone could also be used to manufacture gold both galvanized and debased the quest for the stone.

wild desire to be Daedalus disintegrates his household, but his ambitions far exceed his abilities. No amount of practice will ever allow him "to improve the art so far, 'twill be as common to buy a pair of wings to fly to the world in the moon as to buy a pair of wax boots to ride into Sussex with" (45). Sir Nicholas's uncle despairs that his nephew has spent twenty years "compiling a book of geography for the world in the moon" (31), but, as with Sir Nicholas's observations on the republican government of ants[7] and the friendship of spiders, the virtuoso refuses to see the world around him (his nieces' frustration, his wife's cuckoldry, all the tricks and conspiracies overrunning his home) and instead imagines society elsewhere:

> LONGVIL.
>
> Do you believe the moon is an earth as you told us?
>
> SIR NICHOLAS.
>
> Believe it! I know it. I shall shortly publish a book of geography for it. Why, 'tis as big as our earth. I can see all the mountainous parts, and valleys, and seas, and lakes in it; nay, the larger sort of animals, as elephants and camels; but public buildings and ships very easily. I have seen several battles fought there. They have great guns and have the use of gunpowder. At land they fight with elephants and castles. I have seen 'em. (113)

Selenography (lunar cartography) was a field of research in the seventeenth century, but, as usual, Sir Nicholas misunderstands the work he imitates. Because

[7] A dubious fascination in the years following the end of Puritan government in England and the Restoration of Charles II.

other scholars, including John Wilkins Robert Hooke, interpreted lunar landforms as mountains and seas, Sir Nicholas must surpass them by seeing castles in the air.

Delusions of lunar grandeur inflate Sir Nicholas's self-importance and promise him the greatness he desires more than he desires to make any small but real contribution to science. Sir Nicholas goes even further beyond landforms and beyond architecture: he claims incredible insights into the politics of the moon world, including seeing "a great monarch" (45). Sir Nicholas and Sir Formal agree that Sir Nicholas's work is a "noble enterprise, which is devoutly to be efflagitated by all ingenious persons since the intelligence with that lunary world would be of infinite advantage to us in the improvement of our politics" (45). While Sir Nicholas talks grandly of the moon, whose "influence is the cause so many of us are delirious and lunatic" (45), he fails to recognize himself among the moonstruck. Antiaerial writing is concerned not only with the reckless self-absorption of those who attempt to fly but also with the vaulting ambitions that drive these moonshot projects. No work of antiaerial literature treats the inappropriate desire to rise more scathingly than Aphra Behn's *The Emperor of the Moon*.

Behn's *The Emperor of the Moon* (1687) follows a marriage plot familiar to the *commedia dell'arte* tradition, innovating in the specific scientific details of its satire and in the grand scale of its spectacle. The play follows a socially withdrawn philosopher (Doctor Baliardo), his two female dependents (his daughter Elaria and his niece Bellemante), and their young suitors (Don Cinthio and Don Charamante). Like the young gentlemen of wit and sense in Shadwell, Cinthio and Charamante

devise an elaborate ruse to marry their love interests despite the obstacle of a negligent patriarch.[8] The lovers convince Doctor Baliardo that his house has attracted the attention first of the secret Rosicrucian order and then of the Emperor of the Moon himself. The doctor is eager to be initiated into a great society above common knowledge and to be made father-in-law to a celestial being, so he welcomes the lovers into his house and, ultimately, consents to the marriage of his daughter and niece to strangers whom he believes are the Emperor of the Moon and the Prince of Thunderland. Unlike Sir Nicholas, Doctor Baliardo learns from his error when the trick is revealed and is reintegrated into society. Embarrassed but unharmed, Doctor Baliardo returns to earth and accepts his middle station in the terrestrial sphere.

Strangely, the similarities between Restoration science plays and Shakespeare's *The Tempest* have gone unremarked in the scholarly literature of these plays, but I argue that the Restoration science plays rework *The Tempest* into a satire on would-be enchanters. Like Prospero at the end of *The Tempest*, Doctor Baliardo destroys his books; in fact, *The Tempest* sets the stage for *The Virtuoso* and *The Emperor of the Moon*. Prospero neglected his social responsibilities but is reintegrated into society through the marriage of his daughter, and Sir Nicholas and Doctor Baliardo follow in his footsteps with less success. Shakespeare's story

[8] Indeed, a search of *The London Stage* indicates that significant overlap existed in the casts of *The Virtuoso* (1676) and *The Emperor of the Moon* (1687); for example, the actor Cave Underhill played Sir Samuel Hearty and then played Doctor Baliardo eleven years later.

offered a ready model for Restoration playwrights eager to explore natural philosophy on the stage, including its growing presence in high society. John Shanahan has argued that in 1667 John Dryden and William Davenant adapted *The Tempest* to exemplify "natural philosophical ideas and projects associated with the Royal Society" (92). Thomas Shadwell further adapted the play into an opera in 1674, and all versions of *The Tempest* remained favorites of the Restoration and eighteenth-century stage. *The Tempest* certainly played throughout *The Emperor of the Moon*'s long, successful recorded run between 1687 and 1748. At times, Behn nods towards *The Tempest* to the point of parody: at one point in Behn's play, the servant Harlequin spins an elaborate tale of how he was mistaken "for a strange and monstrous fish" (325), an echo of Trinculo's discovery of Caliban, whom the clown calls "a strange fish" and a "monster" (II.ii). Shakespeare's enchanter, however, knows and controls all that happens on his island; his scholarly distraction is in the past, before the action of the play. *The Emperor of the Moon* borrows key elements from *The Tempest*, including its aerial spirits, the music of the spheres, and spectacular visual effects. Rather than being the master of the enchantment, however, this Neapolitan sage must wait for his guests to dispel the illusions, which are as much the products of his distempered ambition as of their theatrics.

Although *The Emperor of the Moon* was a highly successful play in the Restoration and continues to be performed today, it has received relatively little critical attention, although some scholars recognize the play as a substantial, thoughtful reworking of earlier materials. Al Coppola has argued that the play's

seemingly simple spectacle is a highly sophisticated critique of "a troubling appetite for uncritical wonder in [Behn's] audience, one which transverses all domains of culture: aesthetic, scientific, and, especially, political" (481). I extend Coppola's argument to interpret Doctor Baliardo's uncritical acceptance of spectacle as the symptom of the doctor's inappropriate ambition. Coppola reads the play against the Exclusion Crisis and finds political meaning in Doctor Baliardo's efforts to peek through a telescope into the private world of an imaginary Emperor of the Moon. While Coppola calls science "only instrumental to Behn's satire" on "misplaced spectatorship and enthusiastic credulity" (492), I argue that the play engages more substantially with matters of science than has been recognized previously. Literary and scientific context—including antiaerial writing and contemporary science plays such as the Dryden-Davenant *Tempest* and Shadwell's *Virtuoso*—indicates that science is more than merely a means for generating spectacle in *The Emperor of the Moon.*

Scholars have at times been quick to dismiss Behn's engagement with science because so much of the science in the play appears outdated or fanciful, but this historical judgment is inaccurate. In *The Dark Side of the Enlightenment: Wizards, Alchemists, and Spiritual Seekers in the Age of Reason*, John Fleming argues that "many scholarly definitions of the Enlightenment have been designed in part to exclude important phenomena uncongenial to the definer" (1). Fleming goes on to argue that many "occultists doubtless regarded themselves as men of science. The sciences they pursued were not limited to physics, chemistry, and botany. They

included alchemy, necromancy, haruspication [a kind of divination], sex magic, and the raising of the dead" (126-127). While the Royal Society's official proceedings took little interest in communing with spirits, many of its members (Boyle and Newton most famously) did pursue mystical sciences, and, at least, the wider public did continue to associate the advanced learning of the new science with older, more occult traditions. As I discussed in Chapter 1, many early experimental philosophers deployed the language and metaphors of supernatural beings and phenomena to discuss their work on natural subjects. For these reasons, readers should take seriously Behn's portrayal of Doctor Baliardo as a would-be adept as well as a more traditionally modern natural philosopher.

At his core, Doctor Baliardo desires his pursuit of science to elevate him above his social station. Doctor Baliardo is wealthy and respectable, but the doctor proves impossible to satisfy. It is not enough to use a telescope; he must imagine he can spy into the Emperor of the Moon's private chambers. Likewise, he is not content that his female wards be addressed by the nephews of a viceroy; he desires for himself the attention of a secret intellectual order and the attention of celestial monarchs, the imaginary Emperor of the Moon and the Prince of Thunderland. These episodes indicate the self-serving, ambitious nature of Doctor Baliardo's delusions. The doctor's enormous, twenty-foot telescope is a comic prop in itself, but Behn makes it an instrument of satire in the way that it reveals the doctor's decidedly unreasonable desires to the audience.

Utterly disinterested in the affairs of mortal women, including those beneath his roof, Doctor Baliardo accepts uncritically the pornographic illusion that Charmante produces in his telescope. Charmante, in the guise of an occultist, prompts Doctor Baliardo to search his telescope for elemental spirits. According to occult traditions such as the Abbé de Villars's *Le Comte de Gabalis* [*The Count of the Kabbalah*] (1670), these supernaturally beautiful spirits would be sexually available to mystical misogynists who, like Doctor Baliardo, scorn the company of mortal women. *Gabalis* is a fragmentary and contradictory text; elsewhere, its sylphs are aethereal beings generally above human affairs, though the lowest may serve as guardians to the most elevated humans.[35] The ironic coupling of earthly celibacy with spiritual lust seems ready-made for high burlesque.[36] Doctor Baliardo is deceived when Charmante inserts "a picture of a nymph" lounging on a bed into the telescope and shines a light behind it (285).[37] Doctor Baliardo interprets his improbable observations exactly as Charmante designs because those designs suit

---

[35] As late as 1779, advertisements for the stage magician Herman Boaz claimed "a Communication with Aerial Beings, of which the Learned know well enough that the middle Region of the Air is full, but this Communication he humbly conceives to be owing to his exemplary Life" (qtd. in David Paton-Williams's *Katterfelto: Prince of Puff*, 2008, pg. 94). Although sylphs were in theory distinct from angels and devils both, the distinctions often mattered little.

[36] In the prefatory material to the poem, Alexander Pope attributes the magical machinery of *The Rape of the Lock* (1712–1717) to *Gabalis* (first adapted into English in 1714), though linking a sylph outright to the Shakespearean name Ariel of *The Temepst* (c. 1610) seems to have been Pope's innovation.

[37] Although more commonly associated with woods or streams, aerial nymphs also belong to the occult tradition, though Paracelsus distinguished between nymphs and sylphs in the *Liber de Nymphis, Sylphis, Pygmaeis et Salamandris et de Caeteribus Spiritibus* [*Book of Nymphs, Sylphs, Pygmies/Gnomes, and Salamanders and of Other Spirits*] (1566).

Doctor Baliardo's self-interest. When the philosopher looks up to the moon, he is seeking evidence of his own destined greatness.

Throughout the play, Doctor Baliardo regularly suspends his reasoned skepticism to gratify his growing ego. The doctor returns in a rage to interrupt the midnight revels of his daughter and niece with their lovers and refuses to be pacified when his servant Scaramouch tells him that the music he heard was only the wind. When Scaramouch changes tack, however, and tells the doctor that the music he heard must have been "the tuning of the spheres; some serenade, sir, from the inhabitants of the moon," Doctor Baliardo accepts the lie without resistance (302). In his study of music in *The Tempest*, John Cutts argues that the magic music of Prospero and his enslaved aerial spirit is the music of the spheres. Seeking his own elevation, Doctor Baliardo plays the part of clown rather than master, and he dances to the tune of his enchanters. As a philosophical concept, the music of the spheres denotes an abstract, cosmic harmony, not literally sound. Doctor Baliardo aspires to the high place of an adept, but he demonstrates his own limited understanding.

Finally, *The Emperor of the Moon* shares in the spectacle of *The Tempest*, and the play's final scene features some of the most elaborate stage machinery of the Restoration theater. The astronomers Kepler and Galileo descend on the stage in winged chariots, followed by a large platform supporting the twelve signs of the Zodiac, represented by singing actors. At last the Emperor of the Moon (Cinthio) and the Prince of Thunderland (Charmante) appear in an astonishing flying vehicle that

appears first as the full moon and then as a half-moon chariot. Improbably, these effects are supposed to be produced within a disused portion of Doctor Baliardo's home. These elaborate effects blur the reality of the action represented on the stage. Contrasting with earlier deceptions, the figures presented on the stage, such as the persons of the Zodiac or the famed astronomers, appear without any separate, true identity distinct from their performance of the celestial company. The illusions reach their peak in a matrimonial masque that momentarily eclipses the farce.

The spectacle entertains the audience, of course, but Behn's drama is medicinal as well as spectacular. At this climax, when the performance in the theater becomes one with Doctor Baliardo's fantasy, his hopes are fulfilled and then return sharply brought back to earth. The language of cure prevails in the final speeches of *The Emperor of the Moon*, as Cinthio and Charmante assure Doctor Baliardo that they respect him as a patriarchal figure and as a philosopher and mean him no embarrassment. Early in the play, Scaramouch remarks that his master has gone "a little whimsical, romantic, or Don Quick-sottish" (280), and, whereas Don Quixote was cured by his neighbor disguised as the Knight of the Moon, Doctor Baliardo is at last cured by his servant, who breaks from his character as a Knight of the Sun. This notion that indulgence could satisfy and cure an *idée fixe* had earlier been explored on stage in productions such as Richard Brome's *The Antipodes* (ca. 1640 but still in performance in the latter half of the century). Doctor Baliardo is one of the lucky survivors of the *idée fixe;* most, such as Shadwell's virtuoso-turned-alchemist Sir Nicholas Gimcrack, remain trapped within their obsessions. According to William

Driver Howarth, a scholar of French drama, Molière's comic characters likewise display "to the very end the obsession or *idée fixe* which colours his outlook on life. . . It is a characteristic of Molière's heroes that they are never 'converted': in every case the dénouemoent, far from curing them of their folly merely confirms them in it" (99). Fortunately for Doctor Baliardo, he can accept the dashing of his impossible, inappropriate dream of elevation. Disillusioned, he abandons his soaring ambitions before he flies too high to return safely to the ground. This dramatic persecution of illegitimate science can seem excessive if we trust the scientific community to process and exclude the toxic virtuoso, but eighteenth-century antiaerialism suggests the fragility and vulnerability of the nascent scientific community.

Rehabilitating Satire on the Royal Society

The Royal Society is a fixture of Restoration and early eighteenth-century satire, but these satires can rebound on their authors in the eyes of modern readers, making their authors appear foolish instead of their target. Governments, empires, and even religions wax and wane, but experimental science has grown tremendously in prestige and power since the Royal Society was founded. In her history of science in theater, Kirsten Shepherd-Barr unfavorably compares the Restoration and eighteenth-century theater with Renaissance plays such as Jonson's *The Alchemist* and twentieth-century plays such as Michael Frayn's *Copenhagen*. Shepherd-Barr dismisses the eighteenth-century theater as polished but shallow dramaturgy unable to take a suitable interest in the science it lampoons: "When it

figures at all, science tends to be the subject of ridicule in the drama of this period, an interesting social commentary on its role within culture" (24). Reducing the theater's criticism of the Royal Society to a straightforward attack on a single, monolithic science, however, overlooks both the developing situation of the new science at the beginning of the eighteenth century as well as the subtleties of the satires. Although these satires do attack innovation, the contemporaneous quarrel of the Ancients and the Moderns can too easily cause later audiences to read the satires as simply and backwardly anti-Science.

To understand who exactly was attacked in these satires, we must understand how much of the Royal Society's business had surprisingly little to do with science as we now demarcate it. Science historian Dorothy Stimson contrasts nineteenth-century reform movements with the state of the Royal Society in the eighteenth century. During his Royal Society presidency from 1820 to 1827, Humphry Davy and his allies sought to limit membership in the Royal Society to professional scientists and to ensure that those scientists, professionals rather than simply gentlemen, governed the society. In its earlier decades, the Royal Society had been dominated by, as Stimson says, "antiquarians, statesmen, lawyers and patrons" (198). Other scientists resisted Davy's reforms because the Society's research required patronage, and securing that patronage was often a delicate and highly political matter, one that demanded the non-scientific expertise of gentlemen.

The Royal Society would be embroiled in several political controversies during the Restoration and eighteenth century, but, surprisingly, political leanings

offer no significant explanation of the satirists' targeting the Royal Society. Certainly, the Royal Society generally maintained Whig (parliamentary) leanings throughout the eighteenth century, and, on the surface, there is little wonder therefore that the staunchly royalist Aphra Behn and the Country Party Jonathan Swift would target the Society. The first, after all, had been a spy for Charles II, and the second was an Anglican dean. If we interpret satires on the Royal Society as reflecting an oversimplified Tory vs Whig, Ancients vs Moderns, dichotomy, however, then we face an embarrassing truth: many of the sharpest attacks on human flight came from the Whig side and even from within the Royal Society. The politics of satirizing the Royal Society, therefore, must be more complicated than this.

Far from being a monolith, the Royal Society began as a politically mixed creature, formed by Londoners who left their university appointments when the Restoration replaced Parliament's appointees with royalists. Most notable among them, John Wilkins, a key figure in the Oxford Philosophical Society and Oliver Cromwell's brother-in-law, had been appointed Master of Trinity College, Cambridge, in 1659. During the 1660 Restoration of Charles II, Wilkins lost his appointment to Henry Ferne, who had been chaplain to Charles I. In this light, the Royal Society seems odd from the start, an organization led by Commonwealth favorites but endorsed by the Crown. Despite their Parliamentary connections, however, Wilkins and other members of the society had advocated for religious and political tolerance before the Restoration, and experimental philosophers developed an early and surprising reputation separating them from partisan politics. The ideal

of scientific objectivity often goes hand-in-hand with the idea of scientific neutrality, but it would be naïve to imagine the Royal Society's commitment to experimental science somehow kept it above the fray while universities and other research institutions today struggle to insulate themselves from uncertain political fortunes.

Instead, in the specific case of the Royal Society, historical evidence suggests that advocates of the new science were acutely aware of their delicate political situation. Half-history, half-*apologia*, the *History of the Royal Society* (1667) describes how the experimenters' early gatherings had to be paused amid Restoration turbulence, when "the continuance of their meetings there might have run them the hazard of the fate of *Archimedes*" (58). Although experimental philosophers admired Archimedes, they had little appetite for emulating his death, caused, according to legend, by his love of mathematics and his complete disregard for the Roman army that had conquered Syracuse in the night. The author of the *History*, Thomas Sprat, wrote an elegy for Cromwell in 1659 but nonetheless became chaplain to Charles II after the Restoration. Effusively royalist, the *History* shows, upon careful reading, that Sprat was neither innocent from politics nor deeply committed to a side.

Cautious indifference served the Royal Society well in its early decades, when civil peace remained far from certain. The Indemnity and Oblivion Act 1660 gave many former Roundheads a chance to forget, at least nominally, about politics, but even loyalty to the reinstated Stuart monarchy could provide little protection. After Charles's Catholic heir was replaced by the Protestant William of Orange in 1688,

Sprat found himself (successfully) defending himself in 1692 against forged evidence of his involvement in a conspiracy to restore James II to the throne. The Whig essayist Joseph Addison joked that the real purpose of the Royal Society was to draw "Mens Minds off from the Bitterness of Party" and to distract them with "the Air-Pump, the Barometer, the Quadrant, and the like Inventions" (*Spectator* No. 262). Addison suggested that, had "those busy Spirits" not been kept busy, they might have "engaged in Politicks with the same Parts and Applications, might have set their Country in a Flame." Throughout half a century of revolutions, conspiracies, and crises, neutrality suited both the philosophical foundations of the new science and its political needs. The Royal Society strove to innovate but maintained close ties with aristocratic and religious authorities.

The fluid and diverse allegiances of the Royal Society's members insulated it to a degree from political fortunes, but these mixed allegiances also left the Royal Society open to criticism from multiple fronts in the strongly politicized field of literary satire. Unlike the politically fluid Sprat, the Tory satirist John Dryden depended too heavily on the political fortunes of the moment to weather the storms of 1688, and Dryden lost his position as Poet Laureate to his Whig rival, Thomas Shadwell. Dryden's lampoon of Shadwell as the mock hero of dullness (*Mac Flecknoe*, 1678) devastated Shadwell's reputation among critics even to the present, but Shadwell enjoyed his state triumph until his death in 1692. Aside from being Dryden's dullard, Shadwell is also known today for his comedies, including *The Virtuoso*'s scathing satire on scientific interest run wild. Similar satires by Tory

authors might be compromised by questions of politics, but Shadwell's politics suggest his satire on the virtuosi was not politically motivated. It is therefore worth asking why then Shadwell singled out this group and why his play found great popular success.

Shadwell's criticism of the vacuous virtuoso resembles similar arguments by Aphra Behn, Jonathan Swift, and others across a range of political viewpoints, and aerial motifs mark these virtuosi as so much hot air. The word *virtuoso*, strongly associated with criticism of the Royal Society, raises doubts about the scientific enterprise by linking experimental philosophy with buffoonery. Still, the word *virtuoso* suggests a specific critique: the obsessed natural philosopher possesses a warped perception, a perception thrown out of calibration by his own flawed character. Far from a neutral observer, the virtuoso is vain, ambitious, and dull, seeking evidence mainly of his own genius. Shadwell's Sir Nicholas compulsively brags, saying he can fly as well as a bird. Behn's Doctor Baliardo schemes to marry his daughter to a celestial emperor. The philosophers of Swift's floating island compete for intellectual status while their country lies in ruins below. Because the technologies of daily life in the twenty-first century testify to the power of experimental science, these satires, like episodes of *The Jetsons*, may inevitably feel outdated and comically wrong-headed, but their basic critique of vanity and conceit more closely resembles other satires than has been commonly recognized.

Gulliver's Flight of Fancy

Although the myth of Daedalus and Icarus long predated modern experimental science, antiaerial sentiment is best understood as a phenomenon of the scientific age. Critical study of aerial motifs early in this period suggests new and fruitful vantage points for interpreting the literature of early experimental science. Far from an antiscience text, *The Virtuoso* uses scientific concerns to explore how an ambitious fool's ignorance and pride can ape the studies and postures of the Royal Society while falling short of the Society's real achievements. *The Emperor of the Moon* too unmasks the overambitious philosopher as a failed social climber. A deeply entrenched skepticism pervaded early scientific discussions of human flight, and satirists employed aerial motifs to attack vainglorious imitation of philosophical work. Throughout the Restoration and eighteenth century, antiaerial writing derided the inappropriate ambitions of would-be aeronauts.

For the final major text of this chapter, I turn to the most famous satire of early science, Part III of *Gulliver's Travels* (1726), in which the wayward Gulliver finds himself again marooned in a strange region of the globe. On a flying island called Laputa, Gulliver meets airy philosophers whose competitive devotion to abstract sciences leaves their lives disordered and ineffectual. The ground below, called Balnibarbi, is little better, as dubious improvement projects have laid waste to the countryside. Oddly, the narrative then seems to leave behind the scientific satire as Gulliver meets a necromancer on another island, Glubbdubdrib; a shunned population of immortal outcasts, the Struldbrugs, in another kingdom; and, finally

and perhaps most inexplicably, the Emperor of Japan. This wandering structure, which takes Gulliver from foreign land to foreign land, poses challenges to interpreting Part III. I propose, however, that antiaerial sentiment offers a new avenue towards a relatively unified reading of the text.

Tales of flight had appeared in earlier European literature, most notably in the sixteenth- and seventeenth-century genre of the cosmic voyage. Copernicus, Galileo, Kepler, and other astronomers inspired new interest in celestial places, and geese, waterspouts, and even bottles of levitating dew carried fictional characters to new worlds in the moon, the sun, and beyond. Although these works often served a satirical purpose, reflecting earthly follies from distant (and therefore safer) perspectives, not all instances of flight in long eighteenth-century literature are best described as cases of antiaerial discourse. Antiaerial writing was not merely interested in flight as a scientific or imaginative possibility but understood the art of flying as something particularly dangerous.

Most chapters of *Gulliver's Travels* follow a simple geographical–narrative structure, but Part III follows an unusually meandering course. A perennial castaway, Gulliver usually finds himself in a new region whose culture differs from European society by a central difference (generally size or species). In Part I, Gulliver is washed ashore the diminutive, neighboring islands of Lilliput and Blefuscu, whose warring inhabitants are separated by political and religious differences as small as the tiny people themselves. In Part II, Gulliver visits Brobdingnag, where giants place Gulliver's European concerns into larger

perspective. Finally, in Part IV, Gulliver lives among the Houyhnhnms, intelligent horses who enslave the degenerate, uncomfortably anthropomorphic Yahoos. After each journey, Gulliver returns to England. Unlike the other parts of *Gulliver's Travel*s, however, which confine Gulliver to a single unfamiliar location each, Part III sends Gulliver through a series of distinct islands. These islands, although seemingly unconnected, bring together a surprising but logical assortment of motifs taken from the earlier literature of human flight.

Part III of *Gulliver's Travels* has received more critical attention than *The Virtuoso* and *The Emperor of the Moon*, but this attention has largely been confined to Chapters I–VI, which address Laputa and Balnibarbi, including the Grand Academy of Lagado. Modern scholarship on Part III is founded on Nora Mohler and Marjorie Nicolson's groundbreaking article "The Scientific Background of Swift's *Voyage to Laputa*" (1937).[10] Subsequent treatments too numerous to mention here agree with Mohler and Nicolson's conclusion that Swift closely parodied the real activities of the Royal Society, but scholars continue to debate hotly the real target of Swift's ire: experimental science generally, theoretical as opposed to practical science, scientific imposture, or myriad other possibilities, all likely with a degree of truth. For my purposes here, however, I am chiefly interested in the form rather

[10] A pioneer in the study of science and literature, Nicholson also edited the influential Regents edition of *The Virtuoso* (1966) cited in this chapter as well as *Voyages to the Moon* (1948), which remains the centerpiece of scholarship on the cosmic voyage in early modern literature.

than the content of Swift's satire, although its form and content are intimately linked.

Like fashionable society at the height of the 1780s' balloon craze, the island overflows with celestial motifs. The clothes of its inhabitants are "adorned with the Figures of Suns, Moons, and Stars" (133), and the whole royal court plays a cacophony in order to accompany "the Musick of the Spheres" on their instruments (137). Gulliver cannot hear any music, but his tutor assures him that the people, acclimated to life in the air, can hear literal music from the sky. The people live their lives in dread of astrological portents, and the floating island is physically controlled by astronomers who "spend the greatest part of their Lives in observing the celestial Bodies" through their telescopes (144). The people of the island neither do nor say anything of substance in their lives, despite their high erudition. Laputa is the absurd conclusion of the diseased pride that overran Sir Nicholas and Doctor Baliardo; like the Biblical Tower of Babel, these philosophers seek the heights but find only confusion. Appropriately, the women of Laputa long to leave the island, where their husbands and fathers waste their energies in learned but empty accomplishment.

The floating island elevates its inhabitants to the sky, but their flight is corrupting and without purpose. An enormous magnet keeps the island aloft, perhaps a gesture towards the role of magnetism in popular works of earlier literature concerning human flight and imaginary voyages, including Francis Godwin's *The Man in the Moone* (1638) and Cyrano de Bergerac's *The Comical*

History of the States and Empires of the Moon (1657). William Derham supposed that flight would destroy human society if not accompanied by a matching elevation in human virtue, and Laputa teeters on the brink of catastrophe. Poised on an axle, the island's central magnet can be turned "by the weakest Hand" (141), indicating that using this aerial technology demands no special moral development or discipline. Laputa threatens to crush uprisings in the country below by inverting the magnet and bringing the floating island down to obliterate rebellious cities and regions. Yet this threat seems an empty one, for such an attack might crack the island itself. The floating island is a powerful weapon, but, as Derham predicted, flight can be a weapon of mutually assured destruction.

In understanding the form of Part III, Swift's aerial motifs are important because they suggest Swift's engagement with the culture of human flight that existed at the end of the seventeenth century and the beginning of the eighteenth century. Most significantly, *Gulliver's Travels* belongs to the group I identified in Chapter 1 as Menippean flight narratives. Although perhaps the most widely known imaginary voyage, *Gulliver's Travels* seems distinct from the earlier cosmic voyages of Godwin and de Bergerac; Gulliver never, after all, voyages to the moon, however fantastical his landings may be. These landings in Part III, however, owe a debt to the grandparent of seventeenth-century cosmic voyages: the Menippean satires of Lucian of Samosata. In the wake of new discoveries in astronomy, translators and readers turned to the aerial adventures of Lucian, a second-century Greek satirist whom Christopher Fox numbered among "a relatively small canon [of authors] that

truly mattered to" Swift (80). Part III of *Gulliver's Travels* draws on episodes from Lucian's *True History* and *Icaromenippus or The Sky-Man*. Alluded to in *The Virtuoso* and *The Emperor of the Moon*, Lucian's cosmic voyages form a vital part of the scientific-literary tradition Swift inherited. Northrop Frye describes the Menippean satire as "a vision of the world in terms of a single intellectual pattern," a "free play of intellectual fancy and the kind of humorous observation that produces caricature" (310). Like a telescope, literary voyages offer a perspective on distant scenes, but, as when Gulliver finds European religious conflicts in Japan, the mirrors in these philosophical telescopes more often than not reflect their users and allow them to see their own worlds more clearly.

Gulliver's hapless travels most significantly resemble the ship of *True History*, which Lucian claimed carried him to the moon after a waterspout propelled it into the air, but Gulliver's experience is antiaerial because fascination with living in the sky is satirized in the work rather than merely a vehicle for satirizing something else. On the moon in *True History*, Lucian studies the customs and warfare of the civilizations on the moon and the sun before returning to earth. Further accidents at last bring Lucian to the Island of the Blessed, where he converses with the heroic dead, and through an underworldly land of punishment. Likewise, in *Icaromenippus*, the philosopher-protagonist Menippus grows disgusted with the world and flies on Daedalian wings first to the moon and then onwards to heaven, where Zeus complains of the trivial questions philosophers ask of his divine nature. Gulliver's honored reception in Glubbdubdrib, his audience with spectral heroes and villains,

and his disappointing conversations with the immortal but decayed Struldbrugs echo the dialogues of Lucian. In each case, Swift adapts the model of Lucian's satire to his arguments against self-important philosophers and the complex relations between Ancients and Moderns. The battle to interpret Part III will continue to rage in the scholarly literature, but the later turns of Part III seem less random when the narrative is read within the tradition of human flight literature.

Gulliver's Travels condemns vanity, the mistaking of the trivial for the profound, and antiaerial sentiment considered flight research a trivial misapplication of science. Laputa is a society that has lost itself entirely to aerial obsessions, including airy fashions, airy music, and airy ideas. In their vacuity, simultaneously over-thinking and under-thinking their high ambitions, the Laputans embody the common view of aerial projectors in the eighteenth century. To end this chapter, I will examine some of the public response to the long-awaited discovery of a working flying machine. With this evidence, I argue that old prejudice against aerial ambition remained active into the time of balloons.

Antiaerial Sentiment and the Balloon

The ideas and sometimes even the authors of early antiaerial discourse persisted in popular memory throughout the eighteenth century.[38] The first major treatise on ballooning, Tiberius Cavallo's *The History and Practice of Aerostation* (1785) quotes extensively from *Mathematicall Magick* and indicates that Wilkins's

[38] For a fictionalized, spacefaring Wilkins in the engravings of Italian artist Filippo Morghen in 1767, see Grant McColley's "The Three Editions of Filippo Morghen's *Raccolta*" (1937).

"supposed knowledge of the art of flying" remained a popular reference point in conversations about the new machines (19). By the middle of the eighteenth century, earlier debates on flying machines had gone dormant, known but inactive. In his novel *Rasselas* (1759), Samuel Johnson sketches an artist "eminent for his knowledge of the mechanick powers" (I.33)[39] Johnson showed himself familiar with common arguments for both the possibilities and hazards of human flight. The artist persuades the captive prince Rasselas to the idea of flight with elaborate mechanical theories and promises of benefit: "[W]ith what pleasure a philosopher, furnished with wings, and hovering in the sky, would see the earth, and all its inhabitants . . . How easily shall we then trace the Nile through all his passage, pass over to distant regions, and examine the face of nature from one extremity of the earth to the other!" (I.38–39). The artist swears Rasselas to secrecy, however, asking "what would be the security of the good, if the bad could at pleasure invade them from the sky?" (I.41)[40] When, after a year of research, in which "the contagion of [the artist's] confidence seized upon the prince," the artist tests his wings, he drops like a stone into a lake and has to be rescued "half dead with terrour and vexation" (42). When theory becomes practice, here is another failed Daedalus who makes himself an

[39] For more on Johnson's debt to Wilkins, see Gwin Kolb's "Johnson's 'Dissertation on Flying' and John Wilkins' 'Mathematical Magick'" (1971) as well as Louis Landa's "Johnson's Feathered Man: 'A Dissertation on the Art of Flying' Considered" (1980).
[40] Compare the artist's pros and cons with those of Derham: "[T]he Art of Flying would particularly be . . . of good Use, as to the Geographer and Philosopher; but in other Respects, might prove of dangerous and fatal Consequence" (*Physico-Theology* 268).

Icarus.[41] Although the text does not specify who funds the artist's research, the reader might reasonably suppose he is supported by the prince, who occasionally checks in on the artist's progress.[42] Johnson and many others like him knew the old arguments, and they recognized that, despite centuries of effort, no attempt to build a successful flying machine had yet succeeded in the real world.

That status quo changed with the wonderous balloon flights of 1783, but skepticism of balloons continued to run along familiar lines in part because antiaerial sentiment had not disappeared after early experimental science failed to produce a flying machine. Instead, antiaerial sentiment remained a low undercurrent running through eighteenth century scientific culture. Three years before the invention of the hot air balloon in France, the celebrated French philosopher Charles-Augustin de Coulomb confidently proclaimed to the *Académie des Sciences* "that no endeavor by man to rise into the air can succeed, and only fools would attempt it" (qtd. in Fortier 1). Even given the evidence of balloon launches, Johnson remained critical of the unreliable machines, asking in 1784, "Is this the balloon that has been so long expected, this balloon to which I subscribed, but

---

[41] Classics scholar Niall Rudd cites this incident as one example in his history of Daedalus and Icarus. See Niall Rudd, "Daedalus and Icarus (ii) From the Renaissance to the present day," *Ovid Renewed: Ovidian Influences on Literature and Art from the Middle Ages to the Twentieth Century*, ed. Charles Martindale (Cambridge: Cambridge Univ. Press, 1990).

[42] Miracle-workers, some claiming foundations in science, religion, or both continued to appeal to European nobility for patronage throughout the eighteenth century. For one example, see Melchior Bauer's 1760s appeals to George III, Frederick II, and others for support to build his so-called cherub wagon. I return to Bauer in a note later in this chapter and again at greater length in Chapter 3.

without payment? It is pity that philosophers have been disappointed, and shame that they have been cheated" (qtd. by James Boswell in *The Life of Johnson, LL.D.*, 1791, I.417). Even when balloon launches were successful, Johnson dismissed them as "mere amusement . . . for I do not find that its course can be directed so as that it should serve any purposes" and argued that "The fate of the balloon I do not much lament: to make new balloons is to repeat the jest again" (Boswell 1.417). Benjamin Franklin, of course, famously defended balloons by asking "What is the good of a newborn baby?"[43] The problem of utility, however, continued to plague ballooning even as cost and safety improved throughout the nineteenth century.

Doggerel of the balloon age suggests the fever-pitch of nationalist daring that drove exaggerated hopes for flight. The warnings of Lana and Derham mingled with a new aerial jingoism in verses such as the following:

> The English, a Nation too proud,
>
> Lay claim to the Empire of the Seas,
>
> The French, a Nation lighthearted,
>
> Lay hold of that of the skies. (Fortier 17)

Some, however, offered a more peaceful vision of the future, one predicated on nations remaining within their borders and humanity remaining within its proper sphere:

> Let us leave to each its domain,

[43] For the history of this celebrated quip, see Seymour L. Chaplin, "A Legendary Bon Mot?: Franklin's 'What is The Good of a Newborn Baby?" (1985).

God made the skies for the birds;

To the fishes, He gave the waters.

And to the humans, the Earth.

Let us cultivate it, my dear friends. (Fortier 19)

Although interested parties such as Franklin might plead patience with the slow advancement of a new technology, others felt, as philosophers a century prior had felt, that such patience came at a cost. In an especially scathing indictment of balloons published as a letter to the *Morning Herald*, one anonymous writer, alias "Anti Ariel," summed up the frustration and fears of a public that did not gladly join in the balloonomania fad:

> The ingenuity of man, it is thought, may turn these mere curiosities of speculation, to something that shall have a better, perhaps a worse end than pleasing children . . . Nothing but the grossest folly could ever have thought of applying them in war, yet some French men have speculated that way. In a word, Sir, the rage for seeing this folly is a very foolish one; and will deviate a great deal of money from experiments of use, to those of curiosity, which in every branch of philosophy has always done much mischief. (27 Dec. 1783)

Before and after the invention of working human flight, many thoughtful critics had considered the benefits and costs of human flight and had decided that, in the balance, the effort simply was not worth it.

Rather than being contained to the realm of imagination in the seventeenth and eighteenth centuries, human flight proved a point of heated controversy in early

science, attracting great attention among popular authors and experimental philosophers alike. More than an engineering problem, human flight carried mythic significance, and thinking about human flight developed within a context of repeated failures long before the triumphs and tragedies of ballooning. Skeptical treatises and satires on upward ambition from the early eighteenth century ring familiar in the balloon era. Critics charged celebrity aeronauts with an irreligious vanity in risking their lives for no useful purpose, while crowds remained suspicious of aeronauts as possible con artists when launches did not go as planned.[44] In Chapter 1, I discussed how the first pilot of the Montgolfier balloon, Pilâtre de Rozier, died in a balloon accident in 1785 and was eulogized by Erasmas Darwin as "hapless Icarus on unfaithful wings" (*The Botanic Garden*, 1791, 1:174). Darwin's poem imagines future flying machines, but, for the moment, de Rozier remained fatally mired in a long tradition of failure.

In the centuries preceding the development of ballooning, the myth of Icarus developed into an immense pessimism that shaped both the discourse of human flight specifically and the discourse of the new science generally. This antiaerial writing consisted of satires on would-be flyers as well as pessimistic scientific speculations on the possibilities of human flight. Antiaerial writers and philosophers interpreted flight's obvious, persistent difficulties as natural boundaries on human ambition. The successes of ballooning were new, but its dangers and

[44] A full survey of the popular reception of early ballooning is outside the scope of this space, but in particular see the books by Brant, Lynn, and Holmes cited at the beginning of this chapter.

disappointments were as old as the dream of human flight. In the following chapter, I will examine how the dream remained alive in the face of such nightmarish reality.

Chapter 3. Performing Flight: Wings on Balloons and in the Theater

How do you know but ev'ry Bird that cuts the airy way,

Is an immense world of delight, clos'd by your senses five?

—William Blake, *The Marriage of Heaven and Hell*

On 14 Oct. 2012, a helium balloon carried skydiver Felix Baumgartner to a height of 127,852 feet. His fall (4 minutes, 19 seconds) broke the sound barrier as well as the world record for highest altitude jump. Sponsored by the Austrian beverage corporation Red Bull, the *Red Bull Stratos* project featured a Red Bull-branded pressure suit, a Red Bull-branded capsule, and even a Red Bull-branded mission control room. ("Red Bull gives you wings," reads the company's slogan.) With an alt rock soundtrack and cameras capturing every dramatic, Red Bull-sponsored moment, the project's official video is part NASA and part X Games. Although certainly a technological achievement, the jump raises questions about the value of breaking records for the sake of breaking records.[45] In any case,

[45] Mount Everest firsts now include such oddball achievements as first twins to climb Mount Everest together, first two people to marry on top of Mount Everest, and first to descend by snowboard. Although entertaining trivia in their own way, these records can be dangerous. The snowboarder's second attempt, to set a more specific snowboarding record on Mount Everest, proved fatal.

Baumgartner's record above was quickly broken; in 2014 Alan Eustace jumped from a height of 135,889 feet. Unlike Baumgartner, Eustace was not a professional daredevil but Senior Vice President of Knowledge at Google.[46] Equipment from both jumps are exhibited in the collection of the National Air and Space Museum, along with the high-tech balloon gondola of the *Bud Light Spirit of Freedom* (first nonstop solo flight around the world, 2002).[47] I begin with these balloons not to humbug their achievements but because they exemplify a storied fusion of high science and unabashed commercialism.

While an aerospace company at least demonstrates its professional abilities by producing a high-profile ballooning stunt, other sponsors trade on their association with a record-breaking spectacle. Publicity, not scientific merit, puts these balloons into the sky and their sponsors into the history books. In Chapter 2, I maintained that early skeptics saw flying machines promise much and deliver little, yet flight remained a popular theme. In Chapter 1, I showed that real flights only made up a portion—and a small portion at that—of the flights recognized in the long eighteenth century. Early flight carries philosophical and creative significance far in excess of its real utility and real limitations, and real and imagined flights alike

---

[46] The jump was not actually sponsored by Google, but Eustace's behemoth employer has obscured the lesser-known Paragon Space Development Corporation that engineered the stunt. Ironically, Eustace had declined Google's support because he "worried that his jump would become a marketing event" ("Parachutist's Record Fall: Over 25 Miles in 15 Minutes").

[47] For discussion of these artifacts as technological achievements, see Robert van der Linden's *Milestones of Flight: The Epic of Aviation with the National Air and Space Museum* (2016).

joined in the pursuit of spectacle. In this chapter, I examine the spectacle of early flight to argue that the success of ballooning did not replace the existing culture surrounding human flight. Instead, ballooning was quickly incorporated into that culture, a tradition that drew few distinctions between flights real and imagined so long as those flight were spectacular.

In the Tissandier Collection of the Library of Congress, there is a mysterious etching of flying machines that once accompanied a now-unidentified publication. Shown below in Illustration 5, the engraving exhibits such a bizarre assortment of aerial miscellany that one might be hard pressed to identify the strangest machine of the lot. Putting aside the wing schematics and parachute demonstrations and other differences between them, all of these designs except one date to the period 1783–1797. The four-balloon sailing ship in the upper left-hand corner, however, dates not to the late eighteenth century but to over a hundred years before, 1670. Furthermore, this flying boat is imaginary, while the other machines shown here all really existed. While this odd juxtaposition could be just that, an oddity, images such as this one populate nineteenth-century histories of human flight. The Huntington Library Aeronautica Collection includes several colorful art prints depicting real and fictional flying machines side-by-side. The National Air and Space Museum holds a collection of decorated plates, vases, and tiles that follow the same principle. The fact that many of these flying machines never existed in reality, let alone successfully flew, seems beside the point. Like mythological monarchs included by tradition in an imperial lineage, these designs attested to the long descent and

legitimacy of humanity's conquest of the air. In this chapter, I examine the diverse images of flight that circulated before and after the invention of ballooning in 1783.

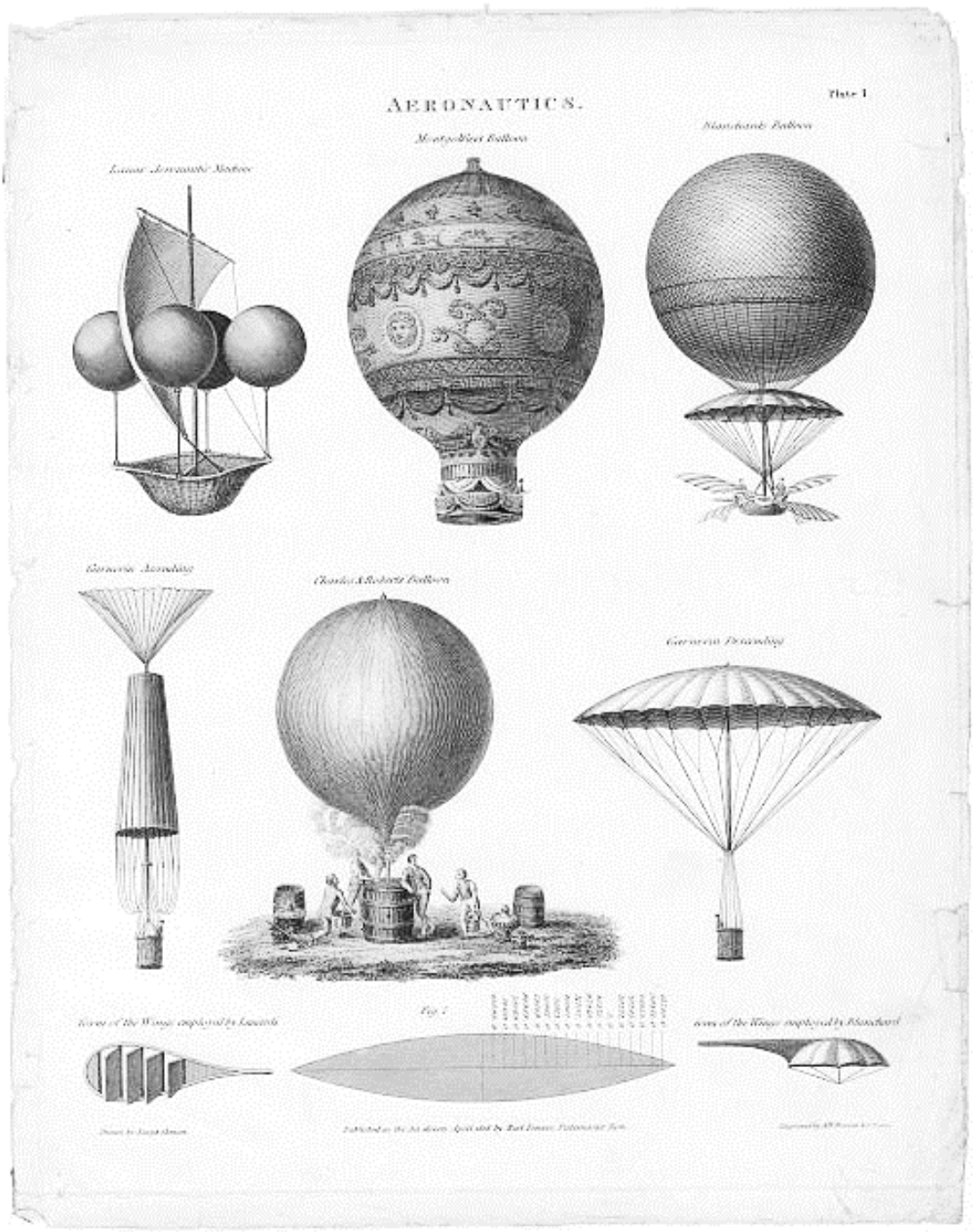


Illustration 5 "Aeronautics" (1818)

The visual spectacle of flight supersedes early flight's severe practical limitations. In the first part of this chapter, I examine images of real and fictional flights to explore the irregular progress of early aeronautical science. Grounded in their creators' pet theories of flight, these flying machines nonetheless retain fantastical echoes of magical journeys. Conventional wisdom holds that flight research stagnated during the eighteenth century, but I instead find diverse, active experimentation that becomes apparent if the idea of progress is not so rigidly bound up with the idea of success. In the next part of the chapter, I take up the earliest balloons and show that these machines had much more in common with their failed predecessors than has been hitherto recognized. Spectacle and the need to provide a sense of visual completeness drove the designs of early balloons. Finally, I draw these real flying machines once more into the boundary between reality and fiction by demonstrating how balloons became immediately entangled in the entertainment culture of eighteenth-century London. While balloons failed to live up to the hopes or fears projected onto them, their spectacle remained a powerful appeal to a public eager for wonder.

Traditional history of flying machines has been prey to the benefit of hindsight. A modern reader with some understanding of today's flying machines can laugh at the unexpected variety of early flying machines while picking out a few examples that seem to foreshadow later inventions such as balloons and airplanes. I argue that eighteenth-century flight was a multithreaded process that played out along diverse lines in science and culture. Multiple theories of flight were

entertained simultaneously, and, when progress towards a flying machine was made, that knowledge often spread unevenly and even inaccurately. Furthermore, what progress entailed was far from obvious, and varied flying machine designs competed and hybridized before and, significantly, after the development of aerostatic ballooning in 1783. I analyze the many images of flight available to early audiences, including illustrations, pantomimes, and balloons themselves, to reconstruct the visual vocabulary of flight in the long eighteenth century.

Previous studies of literature and science have turned to the theater to explore popular conceptions of science, but these studies have largely limited themselves, firstly, to the seventeenth-century stage and, secondly, to the form of legitimate drama as performed in patent theaters. In recent decades, scholars have favored William Shakespeare's *The Tempest* (c. 1610), Ben Jonson's *The Alchemist* (1610), Thomas Shadwell's *The Virtuoso* (1676), and Aphra Behn's *The Emperor of the Moon* (1687), with Shakespeare and Jonson heavily favored.[48] The emphasis on these texts reflects an unfortunately common disregard for the eighteenth century in studies that trace modern science from its origins to the present day. This willingness to leap over the eighteenth century obscures the place of science on the

[48] I discuss recent scholarship on Shadwell and Behn as well as my analysis of flight in their respective satires in Chapter 2. Although *The Emperor of the Moon* draws on *commedia dell'arte* traditions, it is not a pantomime or afterpiece. It does not follow the English pantomime conventions later codified in the eighteenth century, and records in *The London Stage* (1960–1968) indicate that *Emperor* was performed alone or with an afterpiece rather than serving as an afterpiece itself. Several entries refer to *Emperor* explicitly as a mainpiece. The spectacle of the three-act *Emperor* makes it a hybrid piece by the standards of later eighteenth-century theater. I will discuss an obscure pantomime adaptation of *Emperor* later in this chapter.

eighteenth-century stage. Kirsten Shepherd-Barr's *Science on Stage: From* Doctor Faustus *to* Copenhagen (2006) largely disregards eighteenth-century theater to move quickly from Elizabethan luminaries to nineteenth- and twentieth-century playwrights such as Henrik Ibsen and Tom Stoppard. In his study of the Dryden-Davenant *Tempest* of 1667, however, John Shanahan argues that we must "recognize how in the evolution of the new science in the sixteenth and seventeenth centuries the boundaries of theatricality, empirical experimentation, natural magic, and wonder display regularly overlapped" (93). In this chapter, I extend Shanahan's argument to the eighteenth century to explore how aeronautics participated in popular entertainment culture and especially in the infinitely adaptable spectacle of pantomime.

Recent scholars of balloonomania have begun to remedy the above-mentioned neglect of science and the eighteenth-century stage, but their studies have been narrowly historical, focusing on ballooning as a fad in popular culture. Elizabeth Inchbald's *The Mogul Tale; or, The Descent of the Balloon* (1784) has by far attracted the most sustained critical attention among the works of literature prompted by the balloonomania craze of the 1780s.[49] Inchbald's farce has attracted

[49] See Mita Choudhury's "Gazing at His Seraglio: Late Eighteenth-Century Women Playwrights as Orientalists" (1995), Daniel O'Quinn's "Inchbald's Indies: Domestic and Dramatic Reorientations" (1998), K Green's "Balloon and Seraglio: Burkean Anti-Imperialism in Elizabeth Inchbald's *The Mogul Tale"* (2010), Michael Tomko's "'All the World have heard of the Devil and the Pope': Elizabeth Inchbald's *The Mogul Tale* and English Catholic Satire" (2012), and J. Robbins's "Up in the Air: Balloonomania and Scientific Performance in Elizabeth Inchbald's *The Mogul Tale*" (2015).

critical attention for discussions of Orientalism as well as discussions of ballooning. I do not, however, know of any previous study that has examined *The Mogul Tale*'s contemporary, Dibdin's pantomime *The Magic of Orosmanes* (1785). The relative realism of *The Mogul Tale* may account for some of the serious attention it has received compared to pantomime, but another balloonomania farce, Frederick Pilon's *Aerostation; or, The Templar's Stratagem* (1784), has, like *Orosmanes*, completely eluded critical attention and remained lost in the province of the great unread. For focus, I regretfully too have omitted analysis of *Aerostation* from this chapter, but its distinctive blend of contemporary detail and magical science make it a valuable companion to *The Mogul Tale* and to the pantomimes I examine in this chapter. The balloonomania pantomimes, which are both familiar as examples of a highly conventional form and yet unfamiliar as texts rarely read, shed new light on the balloonomania phenomena, namely by illuminating the ways in which balloonomania productions were typical rather than atypical. Despite the novelty of the new invention, the aerial fad operated within theatrical traditions of aerial performance.

The absence of *Aerostation* from the critical record is particularly striking because scholars of balloonomania have noted other, less obviously titled examples of ballooning on the English stage. The appearance of a balloon in the *Pantomime Lancashire Witches; or, The Distresses of Harlequin* (1783) is easily overlooked, but John Robbins notes the brief, early, dangerous vogue for inflating a real balloon on

the stage in late-1783 and early-1784.[50] Recent scholarship mentions balloon pantomime but does not examine it.[51] Instead, in these publications, scholars collect titles as evidence that balloonomania existed, and only rarely is a text itself examined at length. Compared to plays, entertainments such as pantomimes have left a limited textual record, but online databases now make it easier than ever to access, search, and collate the resources that have survived to the present day. In the following pages, I use published texts of pantomimes where available, but I supplement these texts with newspaper advertisements, printed images, and less familiar materials, such as a carved chair, to rebuild the cultural environment in which these pieces were performed. Ballooning has been recognized as one of the greatest scientific and popular spectacles of the late eighteenth century, but it was one spectacle among many. Ballooning adopted the existing visual vocabulary of flight even as it added new words to the lexicon.

Within this visual vocabulary, motifs associated with flying frequently appear without regard for the seriousness or reality of what is being portrayed. Above all other signifiers, wings circulate with ease between representations of flight in the theater, the art studio, and even the technical drawing-board where designs for real flying machines were developed. Wings are the oldest and most persistent emblems of flight, and, as examples in this chapter show, no experimental failure could shake

---

[50] Robbins specifically names *Fortunatus* (1783), *Harlequin Rambler, or, The Convent in an Uproar* (1784), and *Harlequin Junior; or, The Magic Cestus* (1784).
[51] Compare the list of balloon pantomimes compiled by Robbins (528–529) with similar lists compiled by Matthew Pethers (2010, 187) and Paul Keen (2006, 510–511).

the widespread belief that a flying machine without wings was failing to live up to its full potential. By virtue of natural habit, wings became customary to flight and therefore all but mandatory to its fulfillment. What Adam Smith wrote of association in *The Theory of Moral Sentiments* (1759) can be readily applied to the association of wings and flight:

> Though, independent of custom, there should be no real beauty in their union, yet when custom has thus connected them together, we feel an impropriety in their situation. The one we think is awkward when it appears without its usual companion. We miss something which we expected to find, and the habitual arrangement of our ideas is disturbed by the disappointment. (227)

Flight proved almost unimaginable without wings, leaving artists and engineers in search of some way to fill the vacuum and to draw on the missing wings.

It seems fitting that the first hot air balloon was invented by two paper manufacturers because the development of ballooning was one of the startling innovations that occur when knowledge is, in the words of Bruno Latour, "reshuffled and recombined" ("Drawing Things Together," 45). Latour argues that scientific breakthroughs do not necessarily occur from a steady accumulation of new knowledge but can also be produced by the reconfiguration of old knowledge in new ways. In a sense, balloons were not new; the Italian Jesuit priest Francesco Lana de Terzi had imagined a flying ship suspended from evacuated copper spheres as early

as 1670 (Illustration 6).[52] The Portuguese priest Bartolomeu de Gusmão was reputed to have flown a model hot air balloon before King João V of Portugal in 1709, but cryptic drawings of his "*Passarola*" machine do not particularly resemble something recognizable as a balloon.[53] Nonetheless, new diagrams of Gusmão's invention, such as the one shown in Illustration 7 sprang into circulation in the 1780s as forerunners to the balloons.[54] The successful development of aerostatic ballooning was a major French achievement, but inventions such as Lana's and Gusmão's offered other nations their own claims to glory. The chemical discoveries of Henry Cavendish (hydrogen, 1766), Joseph Priestley (oxygen, 1774), and other English researchers offered some limited consolation to the national pride, but separate discoveries in chemistry and manufacturing techniques only became balloonomania when arranged just so in 1783.

---

[52] Despite his design, Lana presumed that God would never allow such a ship to be built: "*Dio non sia per mai permettere, che vna tale machina sia per riuscire nella prattica"* [God would never permit such a machine to succeed in practice] (61). I discuss Lana's antiaerial writing in Chapter 2.

[53] In 1940, the artist Bernardino de Souza Pereira created an oil painting of Gusmão with a globular model recognizable as a hot air balloon. The painting is in the Paulista Museum today, and its historical style and subject has unfortunately sometimes caused it to be misidentified as a contemporary representation of Gusmão presenting his invention to the court. Although the current scholarship presents the curious word Passarola without explanation, I suspect it might derive from *passanda rola* [Portuguese, passing dove] or some similar construction. Although eighteenth-century diagrams of the Passarola are flawed and peculiar, we have no real option but to accept that the craft was more likely bird-shaped than globular.

[54] Although the diagram in Illustration 7 includes a key, different reports offer differing explanations of the machine's use of tubes, magnets, and other components. Cf. a mostly but incompletely plagiarized English version of the diagram, National Air and Space Museum, A20140548000.

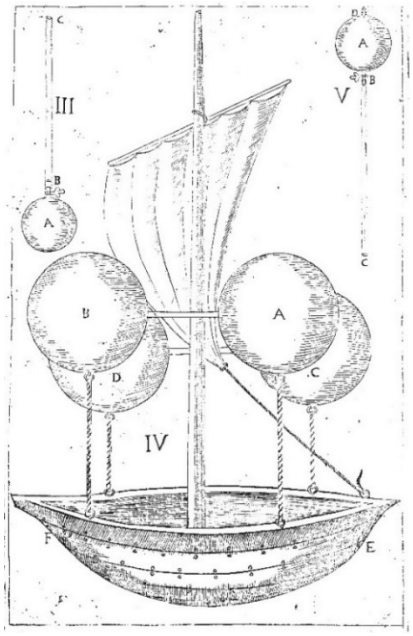


Illustration 6 Lana's Flying Ship shown in Prodromo (1670)

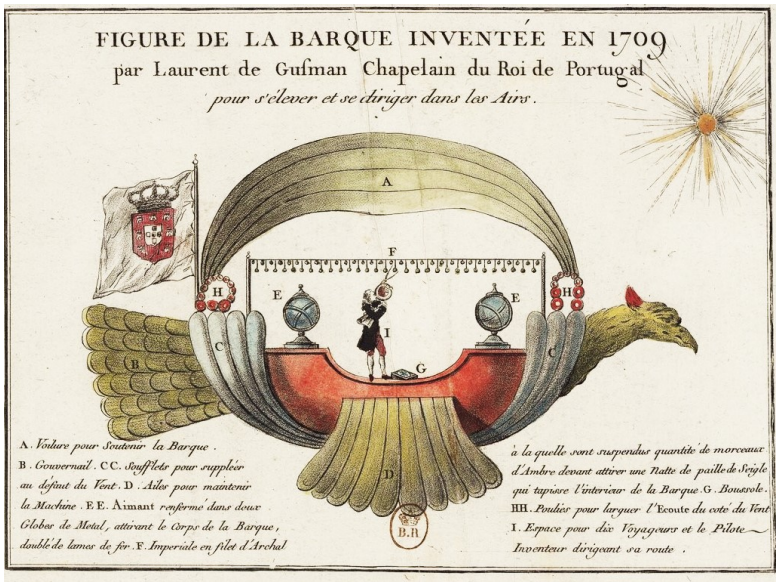


Illustration 7 "Illustration de la Barque inventée en 1709 par Laurent de Gusman Chapelain du Roi de Portugal pour s'élever et se diriger dans les Airs." ["Illustration of the Boat invented in 1709 by Laurent de Gusman, Chaplain of the King of Portugal, to rise and navigate in the air"] (1786)

Uneven Diffusion of Knowledge

Historians of science have often identified the development of a semipublic scientific community in the seventeenth century as a key event in the modernization of scientific knowledge, but this modernization applied slowly to flight research. As I discussed in Chapter 2, established scientific communities frowned on flight's excessive ambition. Flight research therefore often continued outside of regular institutions such as the Royal Society. As I mentioned in Chapter 1, Laurence Goldstein dismisses the eighteenth century as a nadir in the history of flight: "apparently significant numbers of cranks and geniuses threw themselves from rooftops and ran down hills with a mechanism attached to their shoulders. But the theory of flight made little progress, even in the eighteenth century when the vogue of ballooning distracted most people from the hopelessness of heavier-than-air ascent" (41). Goldstein calls technology "an amateur's hobby before the nineteenth century," but I would instead argue that the limited patent protections available to earlier researchers actively discouraged those researchers from participating in a more open scientific process if their goal was financial gain. This disincentive especially applied if the progress made was incremental; the greatest rewards would be reaped by whomever invented a functional flying machine, not by those who laid the groundwork that helped to make that flying machine a success.[55]

[55] A similar rewards conundrum faces the sciences in the academy. The publication of negative results and the replication of existing experiments are in theory essential to the scientific process, but journals, grant organizations, and tenure committees create a strong preference for new, significant, and positive results.

In fact, the exclusion of flight research from the purview of the Royal Society seems to have suited the researchers perfectly well, and I have found no evidence of any researcher struggling to publicize his discoveries. (To be rewarded or celebrated for those discoveries was another matter.) Goldstein lightly suggests, "As there are mute inglorious Miltons in every country churchyard, perhaps inventors who derived from their observations of flying creatures the 'secret' of human flight lie in obscurity because they were unwilling to make public their private discoveries" (41), but researchers in many fields today guard their research without arousing our suspicions of occult charlatanism. Flight research resembled corporate science; the financial incentives that made flight research so appealing also discouraged would-be aeronauts from collaborating.[56] Far from coordinating their efforts, flight researchers worked independently, seeking funding from patrons in order to secure the ultimate prize: a patent on flight technology.[57]

These competitive circumstances created a working environment in which new knowledge spread unevenly if at all. In the following pages, I will examine several flying machine designs proposed in early modern Europe. These models

---

Consequently, p-hacking and the replication crisis represent two of the greatest methodological problems of contemporary science.

[56] Cf. the groundbreaking computer research of the Xerox PARC labs during the 1970s. The company's willingness to share its research accelerated the development of Microsoft, Apple, and other large technology companies that dominate today's technology landscape but ultimately did little to reward the company that invented many of the essential elements of modern personal computing.

[57] Ironically, the balloon spread quickly throughout Europe, and no one received a patent for it. In 1906, the Wright Brothers did patent their three-axis control method that was crucial to achieving sustainable heavier-than-air flight, and the patent became embroiled in legal disputes until after the end of World War I.

delight in their variety, but that variety can suggest that early modern flight was indeed a failed exercise—so many cranks reinventing a wheel that does not turn, lives and fortunes spent without making clear progress towards success. When this subject is approached without leaping to judgement, however, a new and more colorful view of early modern science emerges. It is tempting to search these examples for signs of progress, but, as I hope to demonstrate through this chapter, this model of progress is inconsistent with the actual practice of early science. Instead of coalescing around a single theory of flight, early flight research instead entertained numerous competing theories, and researchers drew freely from competing theories in their quest for ascension.

In this chapter, I will not exhaustively examine the many forms of pre-1783 flying machine, but some comparisons between paired examples will usefully illustrate the wandering course of early scientific thinking. Histories of flight traditionally begin with the notebooks of Leonardo da Vinci, and Leonardo did make significant breakthroughs in the understanding of air pressure and avian flight, but his real influence on early flight research was minimal. His wing studies, such as those shown in Illustration 8, remained entirely unknown, and, one hundred and fifty years later, another Italian Tito Burattini was seeking funding in the Polish court in order to build the outlandish-looking machine shown in

Illustration 9. Historian Clive Hart offers an overview of the lives and work of both Leonardo and Burattini in *The Prehistory of Flight* (1985), so I will not duplicate his work unnecessarily here, but I include these images to emphasize how

visually similar later flying machines are to designs from earlier centuries.[58] These machines do represent incremental mechanical progress, but they are also part of a long tradition that visualized flying machines in the image of monstrous animal forms.[59]

While mechanical wings most commonly characterize early flying machines, novel designs did occasionally appear, and, while none of these rose to the prominence of wings, neither were they forgotten by subsequent generations of would-be aeronauts. Fiction writers authored the flying machines that remained the most well known throughout Europe until the success of ballooning. Domingo Gonsales's fictional flight to the moon by means of specially trained geese in Francis Godwin's *The Man in the Moone* (1638, shown below in Illustration 10 from a later edition) seems fanciful compared to the meticulous diagrams of Leonardo, but both turn to birds as a successful, natural example of flight. By considering what would be entailed in training and harnessing such birds, Godwin makes a scientifically updated version of an ancient fantasy.

[58] Compare Leonardo's webbed wing with Blanchard's wing in the lower-right corner of Illustration 5, for example, or Burattini's mechanical dragon to early modern dragon fireworks, which I discuss later in this chapter.
[59] Early ornithology considered bats a form of horrible bird.

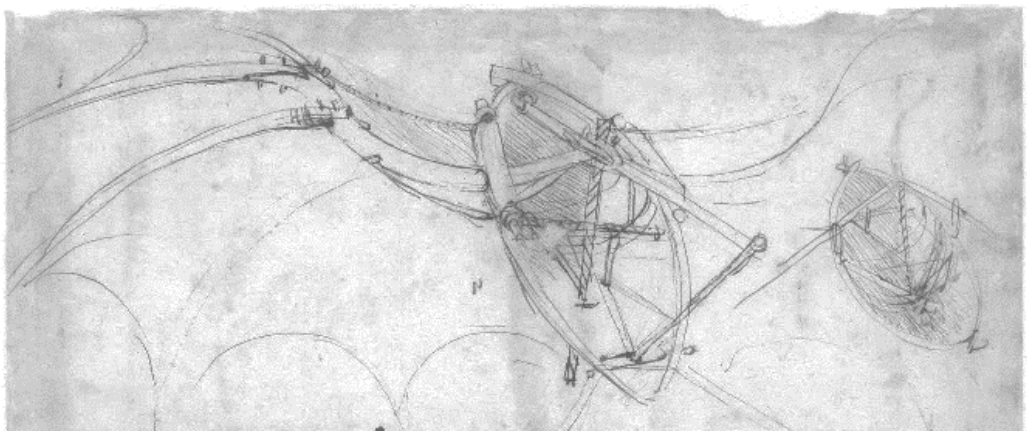


Illustration 8 Leonardo's Flying Machine, Codex Atlanticus (c. 1480, 860r)

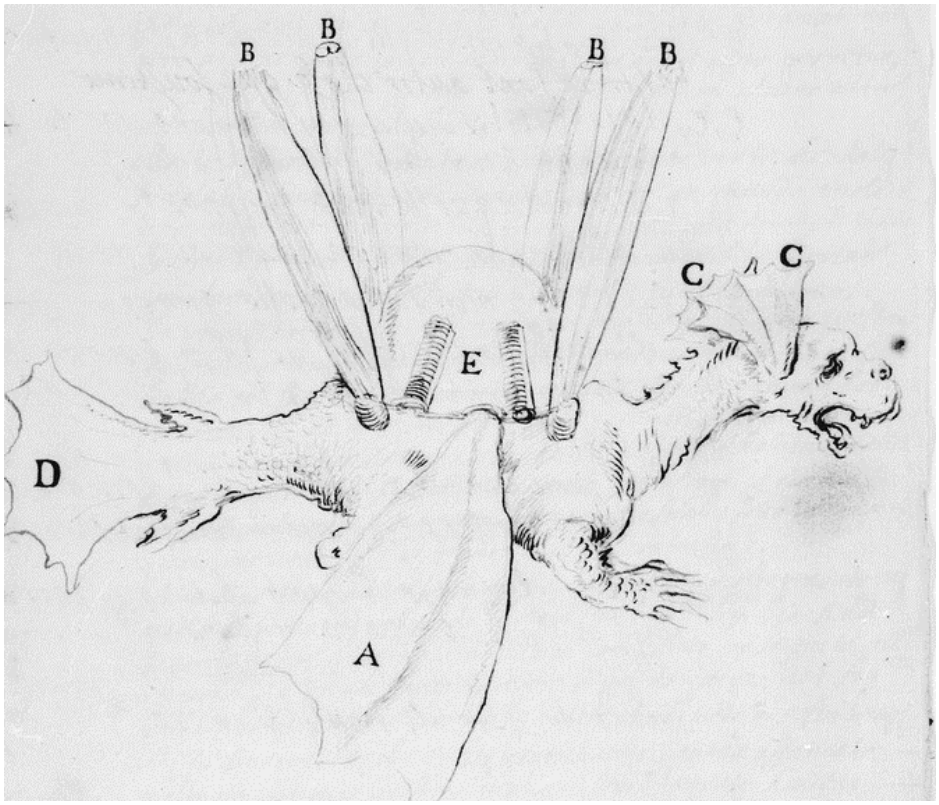


Illustration 9 Burattini's Flying Dragon (c. 1648)

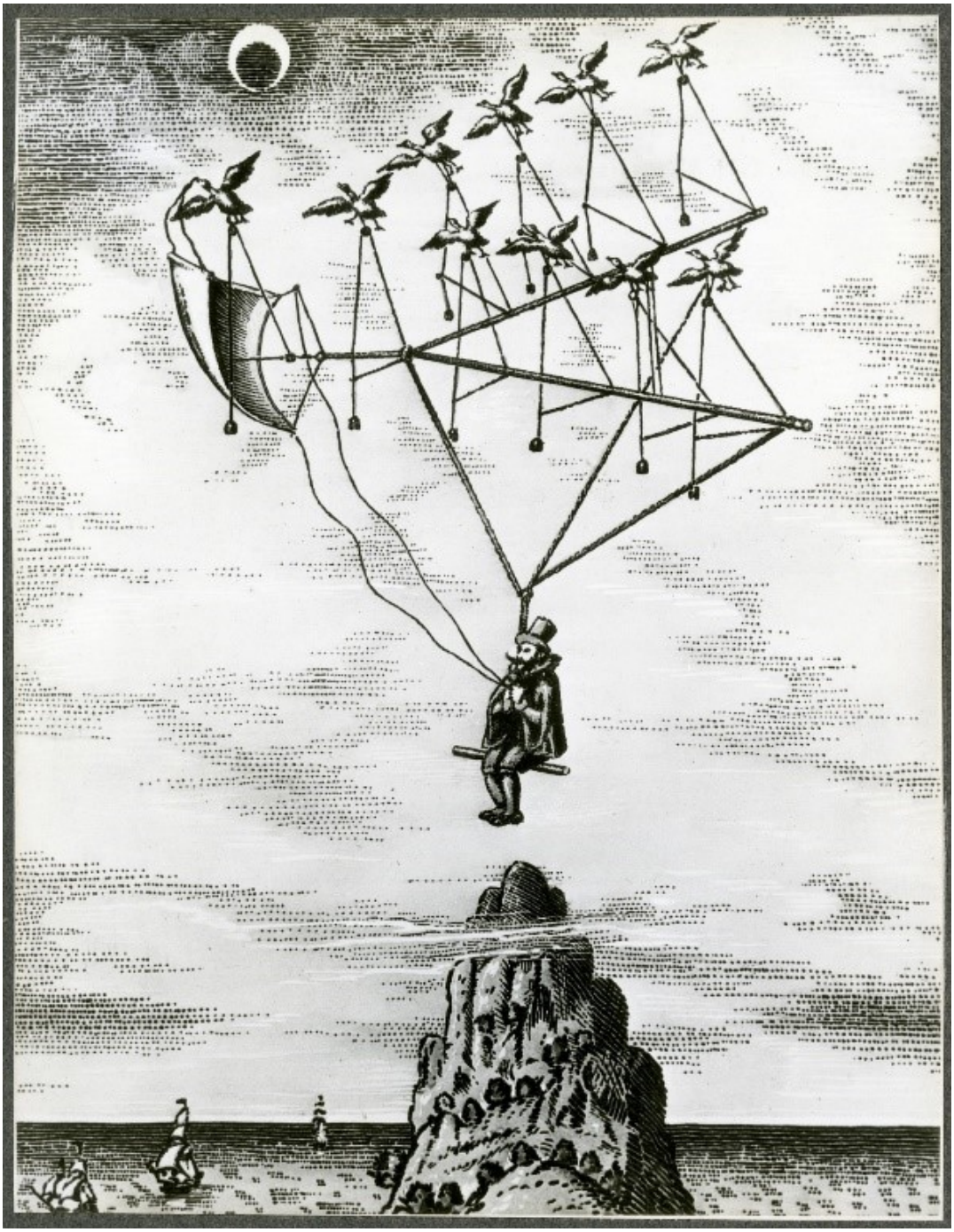


Illustration 10 Domingo Gonsales's Flight by Gansas, Man in the Moone (1657 edition)

Illustration 11 Bottles of Dew, Σεληναρχια (1659 English translation of Godwin's L'autre monde)

Inspired by Godwin, Cyrano de Bergerac offered his own series of scientifically-informed aerial fantasies in *L'autre monde* (1657). Cyrano's dragon-firework recalls the waterspouts of Lucian and anticipates the rockets of our own era. After one flight leaves him badly bruised, Cyrano's narrator rubs himself with suet and finds himself accidentally drawn to the moon.[60] Despite the allusion to witchcraft, Cyrano offers a semi-scientific account of atmospheric and gravitational forces that lend some realism to the fantasy. The same realism graces Cyrano's other flight concepts, such as enclosed glass spheres of evaporating dew (cf. Lana's evacuated copper orbs). Finally, while these forms of flight are fantasies, they were familiar to later thinkers, who returned to them as a source of inspiration. None of these ideas alone produced a workable machine for human flight, but their persistence suggested that they might prove useful someday if reconfigured in the necessary way to create a breakthrough.

In the middle of the eighteenth century, improvements in manufacturing technology suggested a new kind of flying machine, an oval-shaped craft which used tension to flex larger wings than previously imagined. Today, by far most famous of these early flying saucers is the work of Swedish natural philosopher and mystic Emanuel Swedenborg. A traveler who lived and worked in the scientific culture of

---

[60] The connection is mysterious in the story but likely imitates the flying ointment or witches' salve of European folklore. In *Sylua Syluarum* (1627), Francis Bacon notes that "The Ointment, that Witches vse, is reported to be made, of the Fat of Children, digged out of their Gra[v]es," though the materials and efficacy of such flights remained as disputed as everything else about early modern witchcraft (260). The witches I discuss in Chapter 3 prefer enchanted broomsticks to ointments.

London at the beginning of the eighteenth century, Swedenborg was well-acquainted with the earlier writings of Royal Society authors on the subject of flying, including those works by John Wilkins and Robert Hooke. Even so, in 1716 Swedenborg published his "*Utkast til en Machine at flyga i wädret*" ["Draft of a Machine to Fly in the Air"] in his aptly named scientific journal *Daedalus Hyperboreus* [*Daedalus of the Far North*]. An unpublished manuscript contained further details, including a diagram, that have been used to make models of Swedenborg's machine that now sit in air and space museums worldwide. (The National Air and Space Museum's model is shown in Illustration 12.) By producing these models and publishing works such as Henry Söderberg's *Swedenborg's 1714 Airplane*, the Pennsylvania-based Swedenborg Foundation has promoted Swedenborg as a principal actor in the history of flight.

Writing for the Swedish National Museum of Science and Technology, however, Söderberg has argued that "Den var skriven på den tidens svenska språk och blev förmodligen inte läst utanför Sveriges gränser på några undantag när" ["It was written in contemporary Swedish and probably remained, with some exceptions, unread outside Sweden's borders."] ("*'En machine att flyga i wädret': Emanuel Swedenborgs förslag till en flygmaskin år 1714*" ["'A Machine to Fly in the Air': Emanuel Swedenborg's Proposal for a Flying Machine in 1714"] 83). Unlike English and French fictions, this Swedish example, although sophisticated and serious, failed to gain traction outside of its home country. Nonetheless, its central mechanism and saucer-shape do resemble those of some later flying machines.

These machines demonstrate that the winged flying machine tradition was alive and well even less than fifteen years before the invention of ballooning. Density-based ships had floated on water since ancient times, and hypothetical examples of vessels floating in air existed throughout the sixteenth century. In 1671 Robert Boyle discovered the chemical reaction balloonists would later use to fill their balloons with hydrogen gas, although Henry Cavendish's formal recognition of the gas as *inflammable air* had to wait until 1766. The necessary manufacturing capability and conceptual underpinnings of aerostation existed well before 1783. The invention of ballooning depending on the creation of a new spectacle, an enormous balloon soaring over above the assembled crowd. Until then and afterwards, the winged flying machine persisted as a persuasively natural, persuasively mechanical image of an ultimately successful human flight.

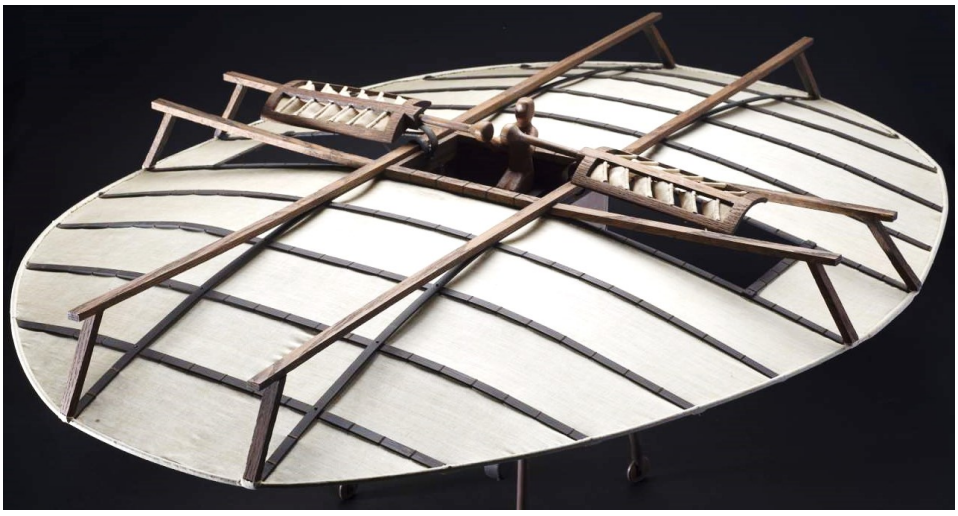


Illustration 12 Swedenborg machine, static model (1961).

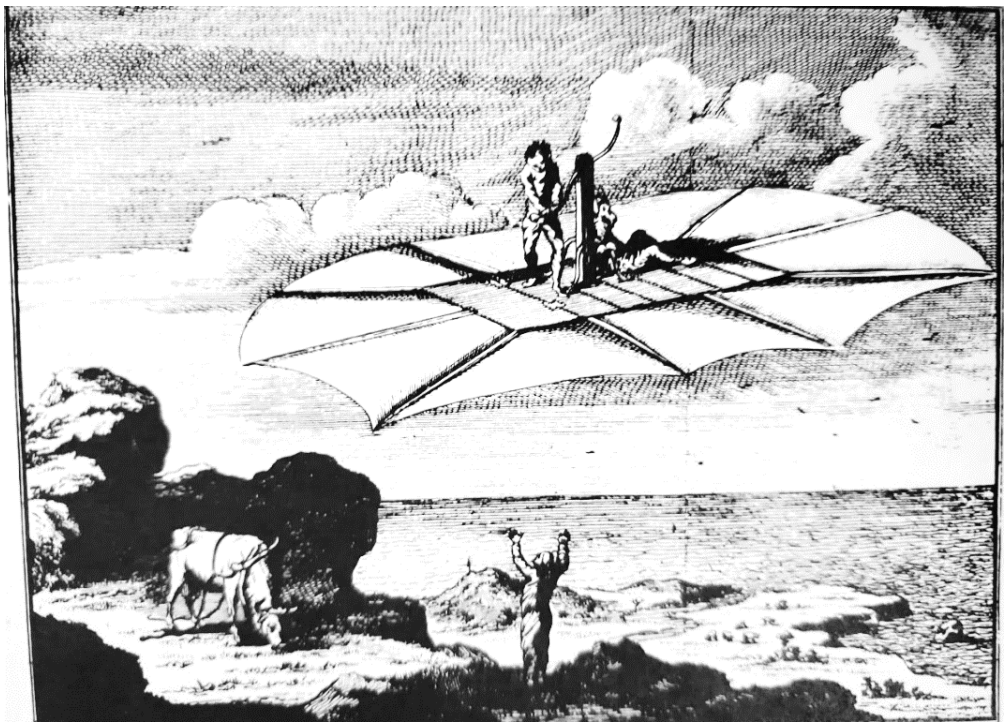


Illustration 13 Morris's Flying Saucer (1751)

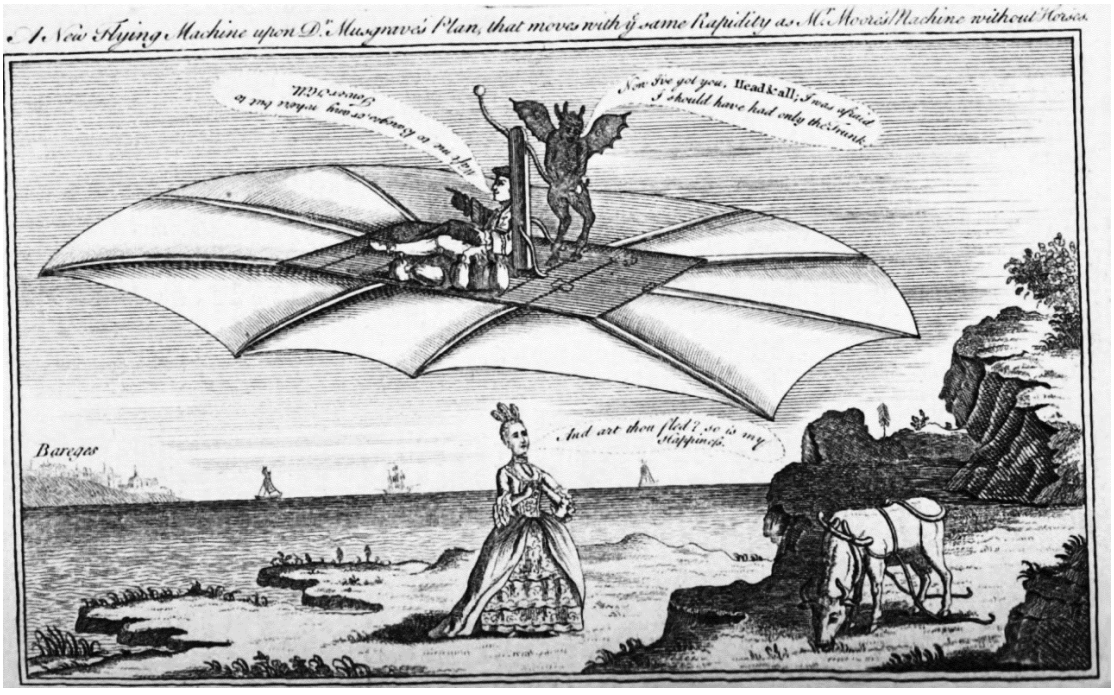


Illustration 14 Satirical Flying Saucer (1769)

Thirty-six years after Swedenborg published his description in Swedish, a similar UFO-type design appeared in English in Ralph Morris's novel *John Daniel* (1751,

Illustration 13). The resemblance seems more indicative of the moment, of parallel invention, than a sign of a direct influence, but Morris's novel, with its detailed technical descriptions, offers one of the most realistic visions of an early flying machine and one of the few examples of an early, realistic flight history written for imaginative entertainment. The design does not, however, offer anything fundamentally new compared to previous flying machine designs. In the novel, the inventor who creates the machine is not blessed with any unique powers or scientific discoveries. Instead, he works with what was known at the time and combines that knowledge in just the right way to create a working flying machine.

Thematically, in Morris's novel and in the history of early flight, the effect matters more than the cause. The attraction is in the flight, not in the mechanism, and the spectacle of the flight can be remembered even if the mechanism that produced it becomes forgotten. Eighteen years after the publication of Morris's novel, a political cartoon borrowed the design while disregarding its technical aspects (Illustration 14). An accompanying article ("Dr. Musgrave's Machine: A Vision") explains the text in extreme detail but departs significantly from the description given in the novel. For example, the central pump creates a kind of booster jet in the satirical machine rather than flexing the wings as in the novel. The author of the satire either misunderstood the novel or, as seems more likely, simply

did not care about the details. The target of the satire, Samuel Musgrave, was a fellow of the Royal Society who accused British politicians of accepting bribes from the French government, an unsubstantiated charge ultimately leading to his own public disgrace. The satire requires a fantastical, quasi-scientific flying machine to carry bribes between England and France, and the allegory is indifferent to whether the machine pumps or flexes. After all, the devil Satan works the pump at the helm of this diabolical machine that shares his bat-like wings. Distracted by the Shakespeare Jubilee, the writer reflects on Prospero's command of aerial spirits in *The Tempest*. Musgrave's conspiracy, like this imaginary machine and like the phantoms of the play, is "melted into air, into thin air" (Shakespeare, qtd. in "Dr. Musgrave's Machine," 110). The flight and its attendant symbolism offer rich intellectual resources unbounded by gravity or quibbling technical details.

Although Satan's inclusion in this satire is more comical than theological, human flight still carried religious significance into the Enlightenment and beyond.[61] As I discussed in Chapter 2, some antiaerial writers found human flight premature in anticipation of Christ's return, but a smaller number of thinkers attached a religious duty to the pursuit of flight, much as eighteenth-century natural philosophers commonly saw their physical experiments as a way to celebrate the divine Creator. In 1763, religious inspiration drove the German inventor Melchior Bauer to design the most mechanically sophisticated flying machine of the long

[61] Consider the iconic iron cross that represents the 1972 Andes flight disaster and the ritual runways of cargo cults. The risks and rewards of flight remain overwhelming forces even after the invention of the airplane.

eighteenth century.[62] Shown in Illustration 15, his so-called cherub wagon modeled its mechanical details on his esoteric interpretation of the prophecy of Ezekiel. Bauer argued that "For it is the counsel of the righteous God that we, mankind, should go in three ways: namely on the earth, on water, and in the air" (qtd. in Hart 167).[63] Bauer's machine was never built, but its striking fusion of complex engineering with Biblical symbolism illustrates a theme common to eighteenth-century flying machines. The charged spectacle of flight lived in grand and daring visions.

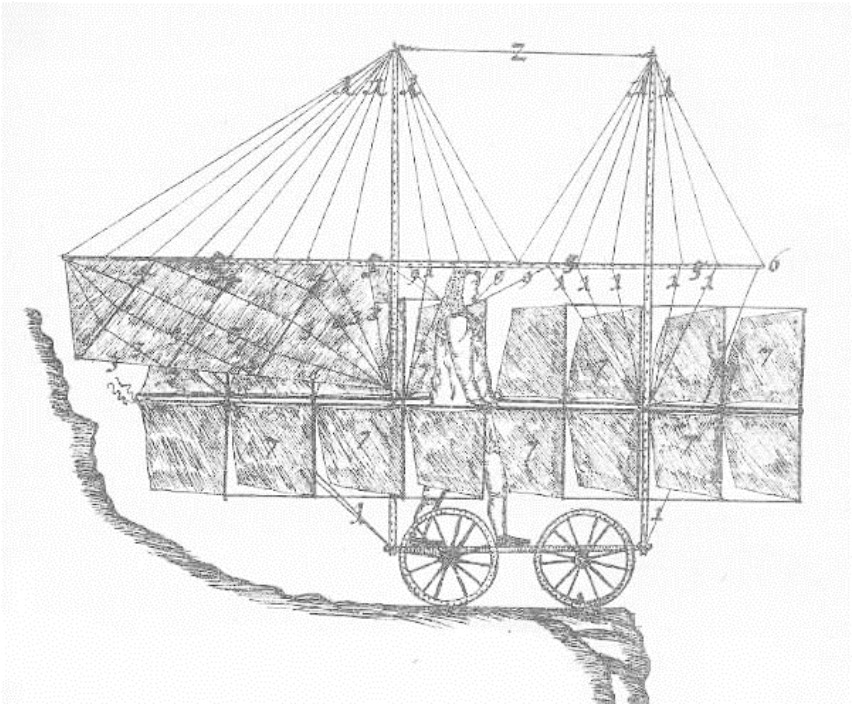


Illustration 15 Die Flugzeughandschrift des Melchior Bauer [The Flight Manuscript of Melchior Bauer] (8) (1764)

[62] Although there are significant differences between Bauer's design and the earlier design by Swedenborg, Swedish historian Hans-Eric Löfkvist has suggested that Bauer might have been influenced by Swedenborg's design (108).
[63] Clive Hart's *The Prehistory of Flight* (1985) includes a detailed breakdown of Bauer's design as well as a transcription of Bauer's difficult handwriting (164–176).

Ambiguous Course of Progress

These examples gesture towards the circuitous diffusion of scientific knowledge that characterized early flight research, but the variety of these creations represents more than ignorance. Leonardo developed expertise in his research on bird flight that was not transmitted to his successors and doubtless Burattini would have benefited from Leonardo's notebooks as he too sought to develop mechanical wings for an animal-like flying vessel. A murkier question is, would Leonardo's speculations have significantly affected the wings of saucer-type craft such as Swedenborg's or Morris's? Would the ornithopter been seen as relevant to buoyancy-based flight such as were envisioned by Godwin, Lana, Gusmão, or the eventual balloonists? The surviving designs show that their creators borrowed prodigiously from whatever sources were available to them, and so I would argue that, if made widely accessible, Leonardo's research would have had some detectible influence on later designs. I will return to this speculation when I consider the winged flying machines of Jean-Pierre Blanchard at the end of the eighteenth century. First, however, I additionally argue that, while progress could and did sometimes occur in early flight research, this progress looks different than modern readers are likely to recognize.

Scientific progress has traditionally been perceived as incremental, revolutionary, or, most recently, both. A student today learns that Newton's law of universal gravitation was replaced by Einstein's theory of general relativity; relativistic physics is both a profound departure from classical mechanics as well as

a refinement of that theoretical framework. Relativity encompasses classical gravity and improves on it by offering greater precision and a capacity for extreme cases such as objects travelling at the speed of light or supermassive objects such as black holes. Newton's equation remains a convenient approximation of gravitation that is easier than Einstein's to apply for everyday, mid-scale applications, but no one could reasonably argue that Newton's law represents a viable, separate, distinct alternative to Einstein's theory. Today, theories of quantum gravity, such as string theory, seek a refinement of Einstein's model that will function on the smallest physical scales and at the beginning of the universe. In this movement between competing theories, succeeding theories offer clear advantages over previous theories, and progress is unambiguous.

Among competing theories of early flight, however, advantage and progress are nearly impossible to determine. Gravity offers an advantageous analogue to flight not only due to its widespread familiarity and thematic suitability (what goes up most come down unless it does not). Buoyant flying machines are not to winged flying machines what general relativity was to Newtonian gravity. Instead, both theories are better compared to competing models of string theory. Some approaches are recognizably more or less workable than others; Godwin's dew bottles inspired little imitation, and certain types of string theory have been effectively ruled out by experimental findings at the Large Hadron Collider. Theoretical physicists cannot currently identify which form of string theory, if any, will ultimately reconcile quantum mechanics and general relativity. Likewise, early

flight research continued in many different directions because it was impossible to say which avenue would ultimately lead to success. For the moment, they were all unsuccessful.

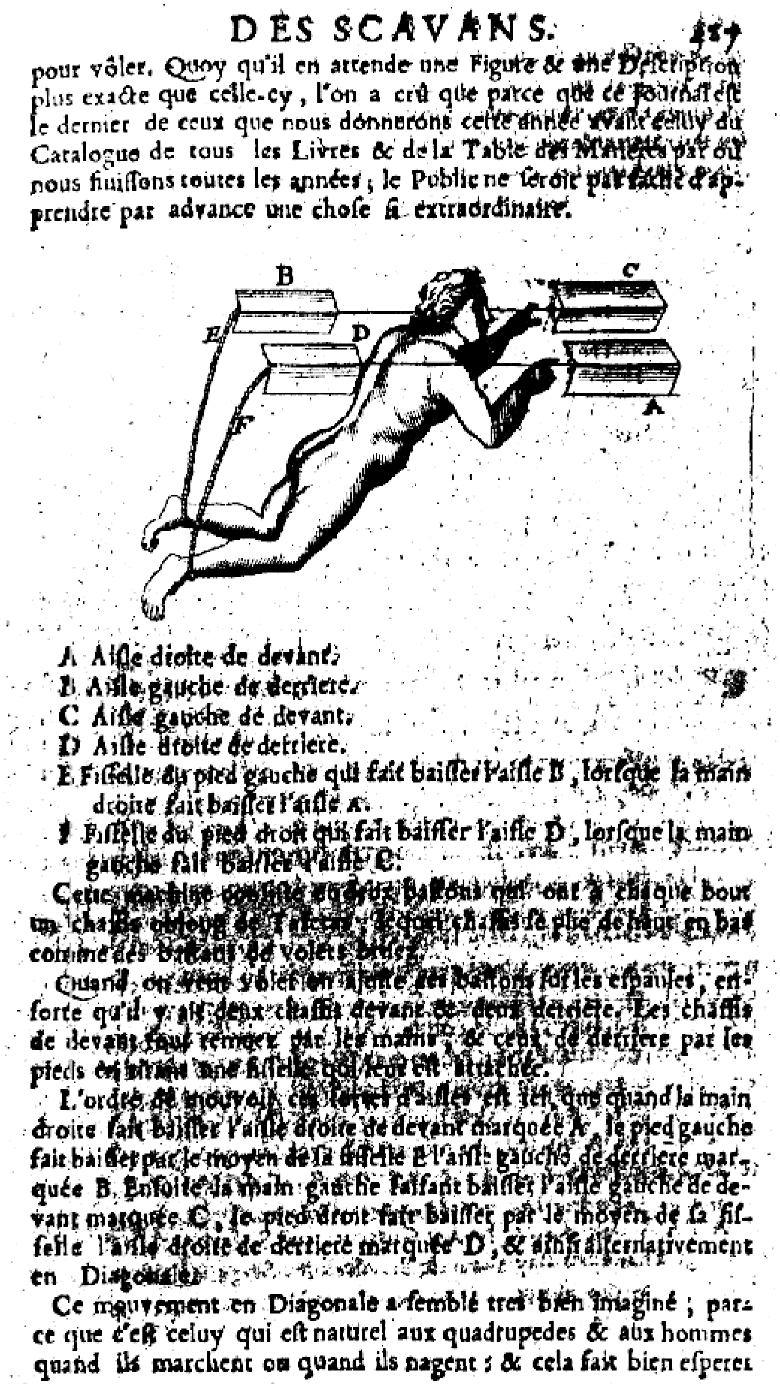
Early flying machines varied so widely because there was no central flying machine concept that all would-be aeronauts worked towards refining. Some of the suggestions previously shown and to follow may strike the modern reader as odd, but they are based on observable natural phenomena. Pet theories certainly abounded in the eighteenth century; Tristram Shandy's father argues passionately in favor of his various hobby-horses. Without a singular, central theory of flight, however, the subject did not generate the kind of stubbornly contrarian pseudoscience that abounds on the Internet today. Fringe theories of gravity—such as whirlpower theory, electrogravitics, and universal acceleration—develop for the same reasons as other conspiracy theories. To rail against the establishment requires an establishment, and early flight research seems to have been insufficiently centralized around any one theory to prompt aggrieved opposition. Outside of the realm of occult books, serious proposals for flight from the intellectual fringe do not seem to have survived to the present, if they ever existed at all.

Even judging which approaches showed promise for further development could be difficult. One of the most famous early flying machines also seems one of the most absurd on its face. In 1678, the French locksmith Sebastian Besnier reportedly found some success paddling through the air with the machine shown in

Illustration 16 (*Le Journal des sçavans* [*Journal of the Knowing*], 12 Dec. 1678). According to legend, Besnier demonstrated his machine by leaping off of tables at parties. I for one cannot imagine that Besnier found any meaningful success with this method, and, tellingly, the method was not adopted elsewhere. The fact nevertheless remains that some witnesses were convinced that he had succeeded, albeit in a limited way, and, in oft-reproduced images over the next century, Besnier came to represent a French aerial tradition predating the invention of ballooning. In Richard Cambridge's mock heroic poem *The Scribleriad* (1751), Besnier embodies a Continental modernity contrasted with a British Classicism, and Besnier defeats King Bladud in a race "By fortune, not superior skill" (Book IV, 16).[64] Despite the poem's colorful treatment of history and mythology, it reflected patriotic prejudices that remained alive and well thirty years later with the invention of ballooning in France. In 1784 one observer noted that the Royal Society was "divided into two factions," those that "despise the balloon, because it did not originate in England" and those that "affirm, indeed, that the principle of the balloon was no novelty to them, but confess, that the French gentlemen who applied it in practice have some degree of merit" (*Morning Post and Daily Advertiser*, 5 Oct. 1784). While Besnier persisted as a symbol of French aeronautical ingenuity, Britain adopted a modern

[64] In the text, Besnier is loosely identified as "a German of distinguish'd fame," but the accompanying frontispiece, Illustration 17, clearly shows Besnier, and "The nimble Briton"is likened to Icarus, hence my interpretation (15). I discussed King Bladud's legendary flight and violent death in Chapter 1.

explorer to replace a mythical king, and Peter Wilkins became the new face of British flight.



DES SCAVANS. 1[illegible]

pour vôler. Quoy qu'il en attende une Figure & une Description plus exacte que celle-cy, l'on a crû que parce que ce Journal est le dernier de ceux que nous donnerons cette année avant celuy du Catalogue de tous les Livres & de la Table des Matieres par où nous finissons toutes les années; le Public ne seroit pas fasché d'apprendre par advance une chose si extraordinaire.

A Aisle droite de devant.
B Aisle gauche de derriere.
C Aisle gauche de devant.
D Aisle droite de derriere.
E Fisselle du pied gauche qui fait baisser l'aisle B, lorsque la main droite fait baisser l'aisle A.
F Fisselle du pied droit qui fait baisser l'aisle D, lorsque la main gauche fait baisser l'aisle C.

Cette machine consiste en deux batons qui ont à chaque bout un chassis [illegible] ; chaque chassis se plie de haut en bas comme des battans de volets brisez.

Quand on veut vôler on ajuste ces batons sur les espaules, en sorte qu'il y ait deux chassis devant & deux derriere. Les chassis de devant sont remuez par les mains, & ceux de derriere par les pieds en tirant une fisselle qui leur est attachée.

L'ordre de mouvoir ces sortes d'aisles est tel, que quand la main droite fait baisser l'aisle droite de devant marquée A, le pied gauche fait baisser par le moyen de la fisselle E l'aisle gauche de derriere marquée B. Ensuite la main gauche faisant baisser l'aisle gauche de devant marquée C, le pied droit fait baisser par le moyen de la fisselle l'aisle droite de derriere marquée D, & ainsi alternativement en Diagonale.

Ce mouvement en Diagonale a semblé tres bien imaginé ; parce que c'est celuy qui est naturel aux quadrupedes & aux hommes quand ils marchent ou quand ils nagent ; & cela fait bien esperer

Illustration 16 Besnier's Flying Machine (1678)

Illustration 17 Aerial Battle between the Ancients and the Moderns (1751)

Although Robert Paltock's *Peter Wilkins* (1750) is little remembered today, the novel offered an enduring vision of flying islanders that reached a wide audience. The novel was popular; it was published five times in English between 1751 and 1800 (1751, 1783, 1784, 1797, and 1800), published in French in 1763, published in German in 1767, published throughout the nineteenth century, and adapted twice for the stage (1800 and 1856).[65] Early twentieth-century critics echoed earlier criticism that the novel was derivative: the book's first review called it "the illegitimate offspring of no very natural conjunction betwixt *Gulliver's* travels and *Robinson Crusoe*; but much inferior" (*The Monthly Review*, 24 Dec. 1750).[66] Despite its faults, however, the novel's imaginative flights struck a chord in eighteenth century audiences. The reviewer notes that the novel, especially its flights, "derived from hints drawn from the *Arabian* nights entertainment" and that the author "deserves encouragement at least as an able mechanic, if not as a good writer."[67] Paltock's description of the fictional *graundee* [fictional language, a folding, biological contraption that serves as both clothing and wings to the

---

[65] The 1750 edition of *Peter Wilkins* is dated 1751 on its title page. The book was in fact published in December 1750, and this marketing choice remains a source of (supremely minor) error in many accounts of the novel. See the publication notices in the *London Evening Post*, 1 Dec. 1750, and the *Whitehall Evening Post or London Intelligencer*, 1 Dec. 1750.

[66] For a full account of the critical fortunes of *Peter Wilkins*, see Peter Merchant's "Snatched from the Sea: The Survival of *Peter Wilkins*" (1990) and Nora Crook's "*Peter Wilkins*: A Romantic Cult Book" (1992).

[67] For the novel's engagement with the *Arabian Nights*, see Marina Warner's *Stranger Magic: Charmed States and the Arabian Nights* (2012). For other sources of the novel, see Peter Merchant's "Robert Paltock and the Refashioning of "Inkle and Yarico" (1996).

islanders, who are born with it] is one of the most detailed and remarkable descriptions of a flying machine in early literature, for Paltock considers at length the mechanics, appearance, and even the multiple reproductive consequences of such a machine. When *Peter Wilkins* was republished in 1783, the same year as the first flights of the balloons, the novel took flight on the success of its wings.

The timing of this republication seems to have been pure coincidence, but the sustained interest in *Peter Wilkins* that followed seems anything but chance. The rapid appearance of a second printing in 1784 suggests that the first had caught the popular current of balloonomania and sold out rapidly. The first edition of the novel had been illustrated with six theatre-ready images of its characters costumes and scenes (see Illustration 18). Recognizing the novel's chief value as aerial spectacle, the 1783 edition discarded the earlier illustrations and complemented the novel's text with seven all-new images (one shown in Illustration 19). Later editions grew even more extravagant. The 1797 edition replaced previous illustrations with a new set of seven images, while the 1800 edition added six additional images to the seven images from 1797, for a total of thirteen images in a book only 127 pages long! This printed spectacle transferred neatly from the page to the stage in *Peter Wilkins; or, Harlequin in the Flying World* (1800), and, according to one reviewer, it became "the universal talk of conversation in all fashionable companies," much as balloons themselves had become fashionable years before (London *Times*, 24 Apr. 1800). In another review, "The new Harlequinade of Peter Wilkins" was praised for its "greater quantity of ingenious machinery, than we ever witnessed in a similar

production . . . Had such a thing been projected in the old days of superstition, the inventor would have been publicly burnt for dealing with the Devil" (London *Times,* 26 Apr. 1800).[68] Far from being superseded by interest in balloons, interest in *Peter Wilkins* was ignited by the public's enthusiasm for all things flight.

Illustration 18 Winged Woman (1751)

[68] Such consciously Enlightened language was common enough in discussions of stage effects. In newspaper advertisements from the 1780s to the 1810s, the philosopher-magician Sieur Herman Boaz (a.k.a. James Bowes) regularly boasted that his performances "in an Age and Country less enlightened, would have appeared supernatural."

Illustration 19 Peter and His Children Observe the Flying Islanders (1783)

Although fanciful, the winged islanders of Paltock's novel illustrate an important paradox of eighteenth-century thinking about flying machines. On the one hand, fictional machines such as those imagined by Morris and Paltock and real machines such as those imagined by Bauer and Besnier demonstrate a widespread understanding that arm-attached wings, such as those of Daedalus and King Bladud, could not produce the lifting force necessary to keep a human body off the ground. Their designs are informed by a real understanding of mechanical construction; even Paltock's biological machinery resembles something that might be built by affixing a membrane over a pole-based framework kept under tension. Like the machines of Swedenborg, Morris, and Bauer, Paltock's islanders belong to the tradition of winged flight that thrived in the eighteenth century even as a successful flying machine eluded discovery. At that time, earlier designs became regarded not as dead ends or failures but instead as sources of potential inspiration. They remained useful as models of mechanical ingenuity and as representations of the idealized flight that ballooning proved unable to deliver.

As a rule, late-eighteenth-century aeronauts found their calling after the first flights of 1783, but one notable exception was French inventor Jean-Pierre Blanchard, who became an early hero of ballooning but also more clearly than anyone embodied the integration of the new machine into an old tradition.[69] In 1782, Blanchard devised the pedal-powered flying machine shown in

[69] I discussed the accomplishments and deaths of Jean-Pierre Blanchard and his famous wife, the aeronaut Marie Blanchard, in Chapter 1.

Illustration 20, which somewhat resembles a samara (winged fruit that disperses the seeds of plants such as elm, maple, and ash tree). Blanchard's machine proved a failure, but, as luck would have it, aerostatic ballooning was invented the following year. Blanchard seized on the new invention and was the first to fly across the English Channel, but, rather than abandoning his old design, Blanchard doggedly tried to improve balloons by attaching his existing four-wing concept onto the new machine (shown below in Illustration 21) (Fulgence and Seller 147). Blanchard's attachment to the past was far from isolated, and other balloonists tried similar constructions.[70] So long as balloons remained impossible to steer, aeronauts turned to the storehouse of the past in search of a solution among the flying machines that had come before.

The persistence of impractical, animal-like wings in aerial designs suggests that the scientific, technical details often perform only a supporting role compared to larger, spectacular dramatic effects. The large surface area of a balloon catches wind like a sail, but a sail can be rotated or withdrawn. A round balloon catches wind equally well from all sides simultaneously, and so the balloon's lateral movement is almost entirely out of its pilot's control. A balloonist can search for favorable air currents by causing the balloon to ascend or descend, but a balloon's flight path largely remains at the mercy of natural wind currents. (Powered dirigible

[70] For a closer look, see the "form of the Wings employed by [Vincenzo] Lunardi" and the "form of the Wings employed by Blanchard" diagrams in the lower corners of Illustration 5 at the beginning of this chapter. Note the hinges on Lunardi's wings and compare with the hinges of Bensier's flying machine in Illustration 16.

airships only came into widespread use in the late nineteenth and early twentieth centuries.) In his 2006 article on the science and spectacle of balloonomania, Paul Keen surveys several of the proposed improvements on balloons, including balloons shaped like fish and drawn by trained eagles (see an advertisement in *Morning Post and Daily Advertiser*, 6 Apr. 1786), so I will not reproduce those remarkable examples here, but I will note the strangeness of these solutions, which retread earlier ground. The trained eagles, for example, suggest the trained griffins in a flying machine said to have been used by Alexander the Great, the trained geese of Godwin, and a flying chariot that appeared in *The Visssitudes of Harlequin* (1784), which I will discuss later in this chapter. Eagles, like other solutions elegant or contrived, ultimately failed to improve the central problem of ballooning.

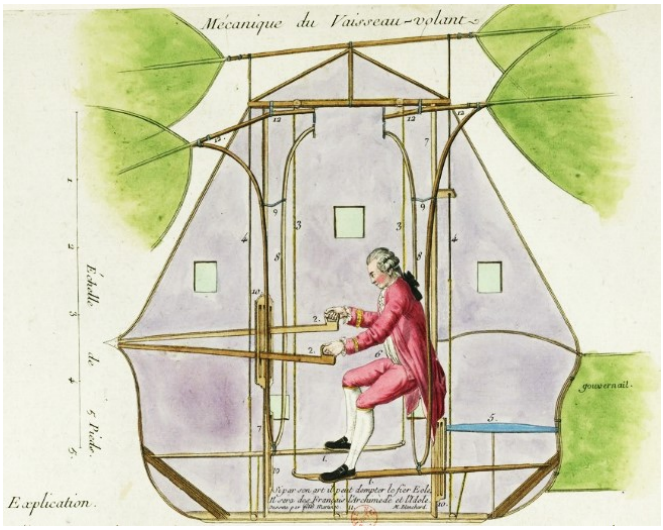


Illustration 20 "Mécanique du Vaisseau-Volant." [“Mechanics of the Flying Ship.”] (1782)

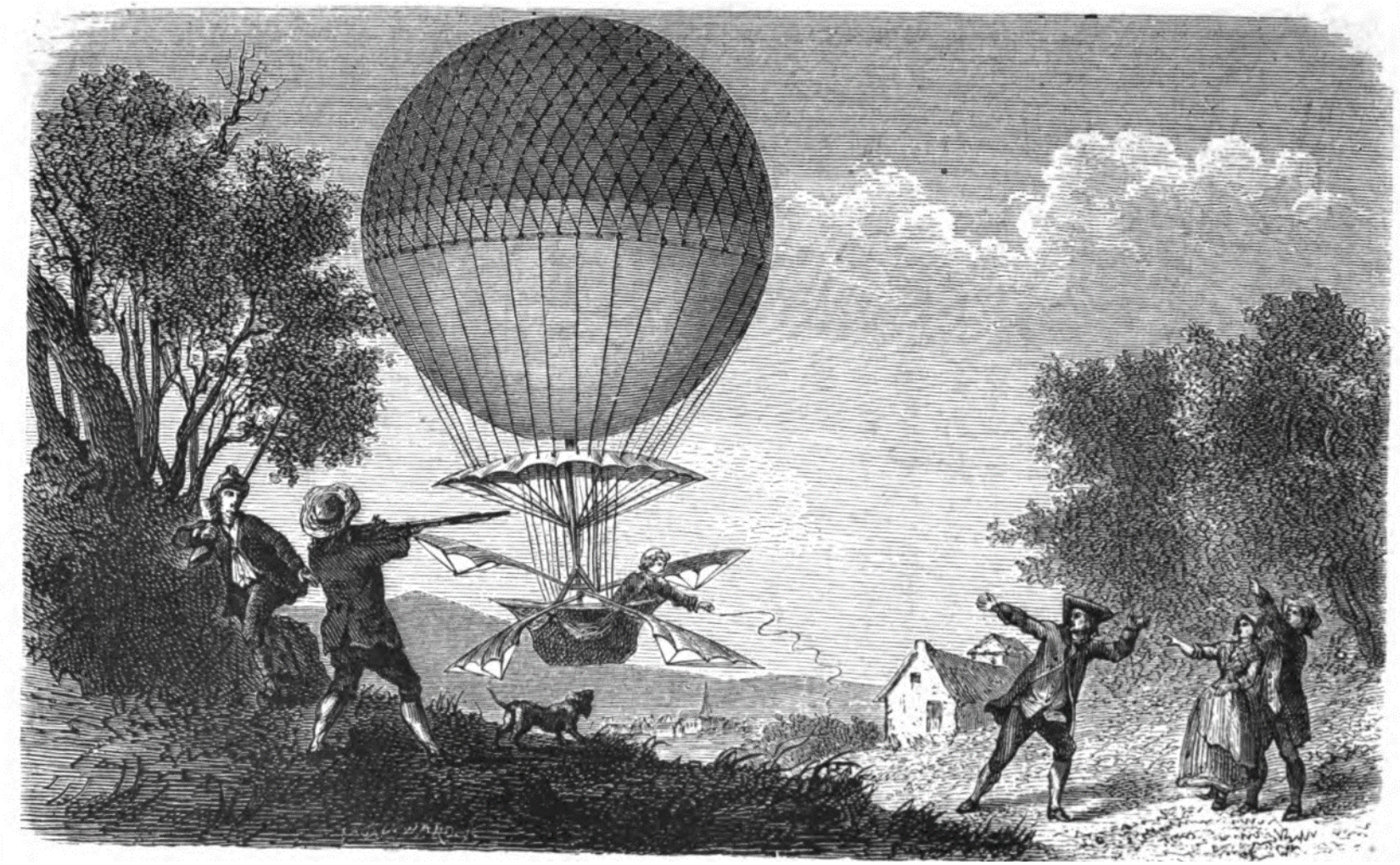


Illustration 21 "Descente de Blanchard" [Blanchard's Descent"] (1784)

Theater in the Flight

The designs shown so far in this chapter demonstrate that the early history of flying machines was a heterogeneous process that combined ideas from different sources in the pursuit of the range of possibilities that could be recognized as flight. To readers of the long eighteenth century, all of the machines shown above represented what flight could look like. They were not, however, the only possible images of flight available to audiences. For the remainder of this chapter, I consider the many forms of popular entertainment that set the stage for British balloonomania of the mid-1780s. Technical diagrams and illustrated novels sometimes circulated surprisingly well within the literary culture, but most people saw flight as part of the varied amusements available in London and throughout Britain. Previous balloonomania scholarship has observed that public balloon launches proved a popular spectacle in an era of increasingly large-scale entertainment and that some works of literature made note of the fad. Hereafter I argue that ballooning not only existed within the same theatrical culture as pantomimes and farces but actively participated in it and was shaped by it. By examining performance texts as well as such ancillary materials as advertisements and artifacts, I show that balloons circulated easily in a cultural economy ready-made for the invention of human flight.

Illustration 22 Tissandier balloon chair (1800s)

Illustration 23 Sévres Bisque Porcelain Plaque (c. 1788)

A recurring theme of my research on human flight in the long eighteenth century has been that the difference between real and imaginary flight is not as significant a chasm as one might expect. Flight-related ideas merge together to create a visual vocabulary of flight that charms most when it contradicts itself. Illustration 22 below shows a chair, one of four, whose beechwood splat has been carved into an image of a balloon with wings. Unlike real balloon wings, however, such as those experimented with by Blanchard (Illustration 22), these wings are fancifully attached to the crown of the balloon. Long-mistaken for eighteenth-century relics of balloonomania, these chairs were only in 2018 identified as nineteenth-century fabrications via X-ray examination of the chairs' dowel construction (Crouch, "Using Science to Solve an Object Mystery"). The chairs seem to have been commissioned by Gaston Tissandier, a French aeronaut and enthusiastic historian of ballooning.[71] Gaston Tissandier and his brother Albert Tissandier were science writers and illustrators as well as balloonists, and they of all people would be well versed in the technical aspects of early flying machine design. In commissioning these chairs, however, the reality seems not to have mattered; the balloon gives wings to the dream of human flight.

[71] The Tissandier chairs are in the collection of the Smithsonian National Air and Space Museum, but the Tissandier Collection proper mentioned at the beginning of this chapter consists of 975 eighteenth- and nineteenth-century documents amassed by the Tissandier brothers in the late nineteenth century. This Tissandier Collection was purchased by the Library of Congress in 1930 and remains in its possession.

Illustration 24 Silk Fan Decorated with Balloons and Pegasus (c. 1783)

To a pair of ballooning historians at the end of the nineteenth century, the imaginative aspects of ballooning evidently seemed integral to a complete account of the origins and meaning of human flight. While the chairs are of nineteenth-century construction, they are emblematic of a significant trend that lived in 1780s balloonomania: the aforementioned willingness to mix and match iconography and influences from different sources to represent human flight. Illustration 24 shows a silk fan fashionable during the balloonomania fad. The illustrations on the fan combine a real balloon launch (center) with an imagined balloon (left), and an armored hero astride Pegasus.[72] Illustration 23 shows one of a set of four decorative porcelain plaques (c.1788) that depict angelic putti inflating hot air balloons and hydrogen balloons with unexpectedly technical precision.[73]

Illustration 25 depicts the knight Rogero (or Ruggiero) and the princess Angelica riding a hippogriff. This last example would not be remarkable in itself, but the page has the handwritten note "aerial fantasy less than half a century before the first flight." Despite the note, the image is almost certainly no older than 1773 and is likely in fact *younger* than ballooning.

---

[72] The leftmost design seems reversed, copied, and colored from a diagram in the anonymous French pamphlet *Considérations sur le globe aérostatique, par M. D.* [*Conssiderations on the Aerostatic Globe, by M. D.*] (1783). For more information on this pamphlet, see Charles Dollfus and Henri Bouche's *Histoire de l'aéronautique* [*History of Aeronautics*] (1942).

[73] In this image, the putti are pouring sulfuric acid in barrels of iron filings to produce hydrogen gas, which is then piped into the balloon.

Illustration 25 Plate X (late 1700s)

Tracing the history of this image has proven difficult. The heroic verse beneath the illustration comes from John Hoole's 1783 English translation of Ludovico Ariosto's Italian epic poem *Orlando Furioso* (1532), but I cannot match the illustration to any of the four known publications for Hoole's translation (1783, 1785, 1791, 1799). An earlier advertisement suggests that the first volume of Hoole's translation was published in 1773, but it is unlikely that ten engravings were made for the first volume (*Morning Herald and Daily Advertiser*, 27 Nov. 1783). This now-lost "First Volume" was "reprinted and corrected," suggesting that it was similar in length to the volume that appeared as part of the completed five-volume set, and the scene depicted in Plate X does not occur until the end of the second volume. It is possible but unlikely that the image could be from the nineteenth century if we interpret "the first flight" to be a reference to the Wright brothers' flight of 1903.[74] This is unlikely, however, because, early in the nineteenth century, Hoole's reputation as a translator suffered greatly under scathing attacks by Robert Southey, Leigh Hunt, and Sir Walter Scott, [75] Hoole's translation of *Orlando Furioso* was supplanted by that of William Stewart Rose in 1823.

---

[74] The image does not belong to Gustave Doré set of thirty-six *Orlando Furioso* illustration (1877).

[75] Although Hoole had the close friendship of Samuel Johnson, Southey called Hoole's translation "vile," and Scott described Hoole as "a noble transmuter of gold into lead" (qtd. in "Hoole, John," *Chambers Encyclopaedia*, 1890). While imprisoned in Surrey County Gaol, Hunt dismissed Hoole's translation as "a miserable business" ("Letter to Mr. Ives," 17 Mar. 1813, reprinted in *The Correspondence of Leigh Hunt, Vol. I*, 1862). Other nineteenth-century critics abused Hoole's translation in similarly dismal terms and worse.

The composition of the image as well as its provenance as a historical artifact suggest my conjecture regarding its ultimate origins. The central foreground figures and the spectacular background imagery leads me to wonder whether it might be a theatrical illustration separate from any full edition of the poem. The four lines of verse beneath the poem would be explained if it was intended to stand alone, separate from the full poem, and the designation "Plate X" makes more sense in a series of theatrical images than as part of an unusually well-illustrated poem. I have not found any recorded late-eighteenth-century stage adaptation of *Orlando Furioso* or *Orlando Inamorata*, but Hoole did write three theatrical pieces for the Covent Garden Theatre (*Cyrus*, 1768; *Timanthes*, 1770; *Cleonice*, Princess of Bithynia, 1775), which were performed as late as 1794.[76] The illustration may be an idealized representation of something seen (sans nudity) on the late-eighteenth-century stage. If this illustration is a piece of theatrical ephemera, its connection to flight explains why it survives after the other images of the set have perished.[77]

Art responded to the new flying machines, but the new flying machines also made themselves works of art. Throughout this chapter, I aim to show the ways, expected and unexpected, that flying machines participated in culture more broadly.

---

[76] Plate X does not appear in any known publication of these plays.

[77] The National Air and Space Museum received Plate X in 2014 as a donation from the Norfolk Charitable Trust as part of the Evelyn Way Kendall Ballooning and Early Aviation Collection. Kendall (1893–1979) was one of the most prodigious of the many collectors of early flight-related materials, and Kendall likely acquired Plate X from another collection, where it had been preserved expressly because it, like the other fantastical artifacts discussed here, was recognized as a meaningful piece of the history of flight.

The balloon depicted in Illustration 22 as part of a chair was modeled on the real balloon of the Italian Count Francesco Zambeccari, a pioneer of both English ballooning and of the marketing of English ballooning. On November 4, 1783, Zambeccari launched the first unmanned balloon in England and sold tickets for subsequent launches. Commercially, balloon launches were an uncertain endeavor due both to the risks and enormous expense involved and to the potential for freeloading. Once launched, a balloon flight was visible to anyone who looked up, an important difference from the controlled environment of the theater. Nonetheless, aeronauts could, like theaters, sell tiers of access and visibility, offering wealthier customers better access to the balloon during the filling process (itself a significant production) and places of public prominence during the launch.

Balloon launches and exhibitions were advertised in newspapers, much as theater pieces were, and advertising in multiple papers over many days could amount to a significant expense.[78] In "Advertisements for Books in London Newspapers, 1760–1785," James Tierney tracks the rising government duties on newspaper advertisements throughout the eighteenth century and argues that advertising costs became prohibitively expensive after 1780, when "a standard two-inch advertisement in a London newspaper" cost 3s.6d (159). Despite the novelty of

[78] Examples offer some idea of what was considered reasonable publicity costs. Richard Sher has observed that advertising for the first edition of Tobias Smollett's *The Expedition of Humphry Clinker* (1771) cost "about 10 percent of the cost of paper and print" and the prolific publisher "John Murray's advertising costs ranged from 15 percent to as much as 30 percent of the cost of production for books published during this period" (362).

balloons, their owners could not depend on balloonomania for free publicity but advertised like other entertainers. If a balloon failed to launch as planned (due to inclement weather or technical difficulties, usually with the production of hydrogen), aeronauts found themselves obligated to defend their reputations in the very papers where they had advertised their intentions and where their critics had castigated their efforts. They shared this dependency on the press with all other forms of public fashion and entertainment.

From the beginning, balloonomania had a place in the theater. Shortly after the first manned balloon launches in autumn 1783, one British critic cried "Woe be to the frequenters of play-houses, if the new French Balloon hats are ever brought into fashion here, in their present form!" (*Morning Herald and Daily Advertiser*, 6 Nov. 1783). A balloon hat is exactly what it sounds like, a hat that imitates the shape and patterning of balloons.[79] William Blake mentions the fashion in his unpublished satire *An Island in the Moon*, and the brevity of the fad is one of the chief pieces of evidence for dating that manuscript's composition to this period. Soon, merchants were advertising "Balloon Cushions and Combs, with every article to compleat a Lady's head-dress in the genteelest fashion" (*Gloucester Journal*, 16 Aug. 1784). Cryptically, one critic advised "the Machinists of Drury Lane theatre, not to make their Balloon so swift of wing—in its first flight, it was like the lightning, and disappeared ere one could say it lightned. On its return, it was not so high mettled,

[79] I return to balloon hats later in this chapter when I examine the text of *Pantomime Lancashire Witches* (1783).

and the audience enjoyed its playful excursions" (*Morning Post and Daily Advertiser*, 10 Nov. 1783). Balloons and theater shared the airy space of popular entertainment in every imaginable regard.

Entertainments of the period typically boast of beautiful new scenery and ingenious new mechanisms to draw audiences away from competitors, and balloons followed in this practice. In his later advertisements, Zambeccari declared that his newest balloon was a balloon of "extraordinary dimensions," "composed of oiled silk, manufactured on purpose, and of a more delicate, elastic, and transparent quality than was ever yet fabricated . . . curiously contrived, and richly ornamented . . . decorated with in a still [style] of unparalleled elegance . . . singularly ingenious, and really superb; no cost, nor invention, having been spared to make the grandeur of the appearance, correspond with the sublime uses, to which constructions of this sort are applicable . . . a truly magnificent aerial vehicle" (*General Advertiser*, 24 Dec. 1784). The curious could purchase admission to see Zambeccari's balloon for themselves "at the GRAND EXHIBITION ROOM, called the LYCEUM in the STRAND." Zambeccari was building on his previous reputation for launching smaller, unmanned balloons in England, and his new balloons promised onlookers something they would not see anywhere else.

Zambeccari's balloon did not launch until March of 1785, but exhibiting the balloon seemed to be repaying some of the considerable costs of its construction. Zambeccari began offering extended viewing hours "At the request of a number of respectable persons to whom the above hours are not convenient, and for the

accommodation of those who may be disposed to see the Balloon on going to the play-houses" (*Morning Chronicle and London Advertiser*, 20 Jan. 1785). As was typical for ballooning advertisements, this one shared a page with ads for other entertainments, including, in this particular issue, the Covent Garden Theater ("With New Scenery, Machinery, Music, Dresses, and Decorations"), the Drury Lane Theater ("The scenery, &c. partly new and partly selected from old and approved Pantomimes"), the Haymarket Theater ("an entirely new Divertissement . . . "With a New PAS De Deux . . . Several New Airs . . . With new Scenes"), and miscellaneous other concerts and magic acts. Zambeccari's balloons were received into the existing entertainment culture, and he paid to place them there. Other balloon examples show that he was far from alone in actively seeking this synthesis.

The first air balloon to carry human passengers aloft, the 1783 Montgolfier hot air balloon depicted in Illustration 27, leveraged the visual resources of the theater to enhance what might have already been expected to have been a most remarkable spectacle. The suspended gallery resembles an elegant theater box, but it is itself a piece of theater: the two aeronauts were in truth confined to small baskets on opposite sides of the balloon and shouted to each other through holes cut in the neck of the balloon.[80] The explanatory text beneath the image identifies the royal emblems that festooned the middle of the balloon: the *fleur-de-lis* and the face of Louis XVI shining as the sun. Louis XVI's great-great-great-grandfather had been

[80] I indebted to Tom Crouch, Curator Emeritus at the National Air and Space Museum, for this rarely-noted detail.

Louis XIV, the Sun-King. The text does not note the entwined, feather-like emblems positioned between the sun-faces, but they represent the royal monogram. The design was a success; Louis XVI soon after ennobled Pierre Montgolfier, the father of the Montgolfier brothers. To deploy an eighteenth-century proverb, it never rains, but it pours, and the visual language of balloon was flooded with symbols of astrological, meteorological, divine, diabolical, and otherwise aerial significance.

Throughout the period, flight attracts aerial symbols like a magnet. In Jonathan Swift's *Gulliver's Travels* (1726), the inhabitants of the levitating island, Laputa, decorate their clothes with suns, stars, and other suitable signs. Their aerial obsessions suggest they belong in the sky even while circumstances suggest otherwise, a fair analogue to the bulbous balloons that looked strikingly unlike dominant visions of a flying machine. Dressing up the balloons suggested that they belonged to the upper regions or at least to the more familiar machinery of the theater. In a rare window into the costume design of historical pantomime, a set of four illustrated pages records the costumes of the pantomime *Harlequin Gulliver, or, the Flying Island* (1817).[81] The costume of the King of Laputa, shown in

Illustration 26, is typical of the collection, his clothing covered in stars and even a solar face that mirrors the beaming golden face of Louis XVI on the

[81] This pantomime should not be confused with John O'Keefe's *Harlequin Gulliver* (1783), which was retitled *Friar Bacon; or, Harlequin's Adventures in Lilliput, Brobdignag*. The pantomime played throughout the entire heyday of balloonomania, but the published songs do not refer at all to Laputa, and O'Keefe's earlier pantomime bears minimal resemblance to the *Harlequin Gulliver* of 1817.

Montgolfier balloon.[82] The historical irony of Louis XVI's height was, of course, his violent fall in 1792–1793 during the French Revolution. I cannot say how intentional this later resemblance might be, but one contemporary reviewer noted that the pantomime satirized "the habits, and waltzing of our French neighbours" (*The European Magazine, and London Review*, 26 Dec. 1818*).* The reviewer was pleased by a dance that incorporated a mechanical zodiac, suggesting that tastes in this sphere had not changed too much since the outfitting of the Montgolfier balloon.

Illustration 26 "Principal Characters in the New Pantomime called Harlequin Gulliver, or the Flying Island." (1818)

[82] For commentary on the effect of the French Revolution on the development of ballooning, see Clare Brant's *Balloon Madness: Flights of Imagination in Britain, 1783–1786* (2017), 257–258.

Illustration 27 "Figure exacte et proportions, du globe aérostatique" ["Exact Illustration and Proportions of the Aerostatic Globe"] (1786)

In a literal way, the balloon's iconography put wings on what was otherwise an unintuitive, wingless vessel. The explanatory text in the Montgolfier illustration notes that "*plusieurs Aigles à ailes éployées paroissoient supporter en áir cette puissante Machine*" [by wings several eagles appeared to support this powerful machine in the air]. The eagles served no purpose but to keep up appearances for the startling new machine.[83] Weeks later, an unmanned balloon launched in England followed suit; a news item announcing the launch concludes: "N. B. The Balloon had a Seal on it, the impression, a Pegasus" (*Morning Herald and Daily Advertiser*, 5 Nov. 1783). The brief text does not specify why the emblem deserved *nota bene* status; the importance of the aerial imagery seems to have been understood as self-evident. Above all, the early balloon signified a grand, even mythic power of aerial swiftness: a later news item in horse-racing advertises a horse named "Pegasus" alongside "That well-bred Horse Balloon," whose parents were named "Highflyer" and "Boreas" (*Morning Post,* 10 Jan. 1794). Classical myths and newfangled machines mix together with little distinction between them. Fashion, theatre, horse-racing—when balloons knocked to be admitted into the company of popular entertainment, it was welcomed with open arms.[84]

---

[83] Other uses of eagles, a symbol of Zeus, appear in conjunction with balloons later in this chapter.

[84] No province of entertainment could bar the passage of the balloon; even the famed Parisian dancer Auguste Vestris found himself performing "in the character of an Air Balloon" with "the emblematic goose carried up in a basket by his side, in imitation of some late continental experiments" (*Morning Herald and Daily Advertiser*, 1 Dec. 1783). The Montgolfier brothers had flown an unmanned test flight with a sheep, a duck, and a rooster on September 19, 1783.

Ballooning not only participated in existing entertainment culture; it sometimes competed with it. Shortly after its triumph in France, the Montgolfier balloon came to England, first in London and then in Oxford. The Montgolfier brothers remained behind in Paris, and the famous balloon was not flown in England, merely shown to the curious public at the Lyceum, where Zambeccari would show his balloon later that year. An advertisement announcing the exhibition (Illustration 28) describes "the Grand Aerostatic Globe of the immortal Monsieur Montgolfier" as "this immense, sublime, and most brilliant spectacle . . . This brilliant and most magnificent spectacle" upon which "beam with effulgent glory, constellations of stars, and all the planets of our solar system . . . the appearance of a huge world floating in the comprehensible infinity of eternal space!" This impressive description does not exactly match other descriptions of the Montgolfier balloon, perhaps suggesting some alterations had been made, but the celestial spirit of the design remained the same.[85] Although the advertisement makes much of the "liberality of a true philosopher" in charging visitors only such admission fees as would cover the cost of the advertisement and rental of the exhibition space, this largesse is exaggerated. At a price of 1s. per head, the entrance fee exactly matched those charged by other balloon exhibitors; I have already mentioned Zambeccari,

[85] The divergent description of the balloon from reality and repeated references to a solitary Monsieur Montgolfier raise questions about this advertisement, but I have found insufficient evidence to disbelieve the basic premise that the Montgolfier balloon was exhibited in England as advertised.

also at the Lyceum, and later in this chapter I will discuss to Vincenzo Lunardi's balloon at the Pantheon.

Though the Montgolfier balloon was allegedly "to be shewn to the English nation without any expence," this marketing concealed the commercial forces that, in truth, determined the price of admission. Entertainment-seekers had options for their shilling, which would also have purchased admission to the Temple of Health, James Graham's "curious and most eccentric lecture" on living to age one hundred and fifty, complete "with a grand display of the self-moving musical machinery of the new Celestial Bed," an enormous, electrical machine used in Graham's lectures on sex (Illustration 28, directly below the Montgolfier advertisement). Other philosopher-magicians of the day, such as Philip Breslaw and Joseph Pinetti, charged 1s. to see their performances. A shilling would also have purchased upper gallery (i.e., cheap) admission the Covent-Garden Theatre or Drury-Lane Theatre. Indeed, for a shilling, Londoners even had their choice of balloons. Immediately to the left of the advertisement for the Montgolfier balloon exhibition, the Drury-Lane Theatre announced that "The real Air Balloon introduced (for the first time yesterday evening) in the new Pantomime of Harlequin Junior, or the Magic Cestus, was received, as was the Pantomime throughout, with every mark of applause and approbation, and will be repeated to-morrow evening after the Comedy." The Montgolfier balloon was both a piece of human history and one glittering show among many in the crowded field of entertainment in the metropolis.

KING's THEATRE.

TO MORROW EVENING, Feb. 7, will be preſented (by PARTICULAR DESIRE) the favourite Comic Opera, called,

I RIVALI DELUSI.

The Muſic entirely New by Signor SARTI, under the Direction of Signor ANFOSSI.

Principal Performers.

Serious Characters by
Signor BARTOLINI, and Signora CATENACI.
Comic Parts, by
Signor FRANCHI,
Signor TASCA,
Signor SCHINOTTI, Signora SCHINOTTI,
And Signora DORTA.

End of Act I. A new Divertiſſment compoſed by Monſ. D'AUBERVAL.

By Mr. SLINGSBY and Monſ. VESTRIS;
Madame ROSSI, Madame THEODORE,
And Madame SIMONET.

End of the Opera, (ſecond time) an entirely new Anacreontic Ballet, compoſed by Monſ. D'Auberval, call'd

LE REVEIL DU BONHEUR.

By Mr. SLINGSBY, and Monſ. VESTRIS.
Madame ROSSI, Madame THEODORE,
And Madame SIMONET.
Cupid, Miſs DECAMP.

The Muſic of the Dances, by Mr. BARTHELEMON.

With new Scenes, painted by Signor NOVOSIELSKI, New Dreſſes, and Decorations, both for the Opera and Dances.

By their MAJESTIES COMMAND,

No perſon can be admitted behind the Scenes.

Pit 10s. 6d. Firſt Gal. 5s. Second Gal. 3s.

The doors to be opened at Six, and begin exactly at Seven o'clock.

N. B. The Nobility and Gentry, Subſcribers to the Opera, are reſpectfully entreated to ſend for their Tickets, now ready to be delivered, as in order to prevent future miſtakes, no body can be admitted without producing a ticket. Attendance is given at the office in Union court, every day from ten till three o'clock, to deliver Tickets, and receive ſubſcriptions.

The doors in Market-lane, and the new door in the Haymarket, for chairs only.——Books of the Ballets to be had at the Theatre, price 6d.

DRURY-LANE.

BY HIS MAJESTY's COMPANY.

AT the THEATRE-ROYAL, DRURY-LANE,
THIS EVENING will be preſented,

JANE SHORE.

Haſtings, Mr. SMITH;
Gloſter, Mr. AICKIN;
Belimour, Mr. PACKER;
Ratcliffe, Mr. R. PALMER;
Cateſb, Mr. PHILLIMORE;
Derby, Mr. CHAPLIN;
And Shore, Mr. BENSLEY.
Alicia, Miſs KEMBLE,
And Jane Shore, Mrs. SIDDONS.

End of the Play, a Comic Ballet, by Mr. and Miſs Hamoir.

To which will be added,

WHO's THE DUPE.

Doyley, Mr. PARSONS;
Gradus, Mr. BANNISTER, jun.
Sandford, Mr. R. PALMER;
And Cranger, Mr. PALMER;
Charlotte, Mrs. WRIGHTEN;
And Miſs Doyley, Miſs BRERETON.

The real Air Balloon introduced (for the firſt time yeſterday evening) in the new Pantomime of Harlequin Junior, or the Magic Ceſtus, was received, as was the Pantomime throughout, with every mark of applauſe and approbation, and will be repeated to-morrow evening after the Comedy of the Buſy Body. The new comedy called the Reparation, which has been for ſome time in rehearſal, will certainly be produced early in the next week; the principal characters by Mr. Brereton, Mr. Lewes, Mr. Parſons, Mr. Farren, Mr. Moody, Mr. Baddeley, Mr. Banniſter, Mr. Packer, and Mr. Dodd; Miſs Pope, Mrs. Hopkins, Mrs. Brereton, Mrs. Wells, and Miſs Farren; with a new

ROYAL CIRCUS.

THE LAST WEEK OF PERFORMING THIS SEASON.

THIS and Every Evening the New Entertainments of this place will be uſhered in by an Allegorical Whim, called

The LAND of ENCHANTMENT.

A Grand Ballet, called,

LE NOCE DU CHATEAU.

A Comic Serenata, called

THE SALOON.

And laſtly, a Pantomime called,

The LANCASHIRE WITCHES; or
The DISTRESSES of HARLEQUIN.

The above performances will be relieved and divided by Cavalcades, Tours de Manege, and Equeſtrian Exerciſes by Mr HUGHES, and his much admired PUPILS.

To conclude with a moſt novel and ſtriking

FIREWORK,

Places for the Boxes to be taken of Mr. Thompſon, at the Academy.

Boxes 3s. Pit 2s. Gallery 1s.

Doors to be opened at five o'clock, and to begin at ſix o'clock preciſely.

In addition to the preſent Watch, a Horſe Patrole is provided to each of the bridges.

Vivant Rex et Regina.

GRAND AIR BALLOON from PARIS,

Forty Feet in Circumference,
At the LYCEUM, STRAND.

MONSIEUR CHEVALIER has the honor of announcing to the Nobleſſe of England, that the Grand Aeroſtatic Globe of the immortal Monſieur MONTGOLFIER, is juſt arrived in this capital from Paris, in its progreſs to the Univerſity of Oxford; and that, in order to gratify their curioſity, this immenſe, ſublime, and moſt brilliant ſpectacle will be exhibited to them for a few days, before its removal to Oxford, in the Grand Apartment called the Lyceum, three doors above Exeter-'Change, in the Strand, London.

As Monſieur MONTGOLFIER, for the honour of ſcience, and with all the liberality of a true philoſopher, has ordained his Air Balloon to be ſhewn to the Engliſh nation without any expence, Monſieur Chevalier permits the domeſtic, who has the honour of ſuperintending it, to receive but One Shilling from each perſon, to defray in part the expences of this advertiſing, and of the noble and moſt commodious apartment in which it is exhibited. It is hoped therefore, that the learned and the curious will inſtantly profit by this public notice.

This brilliant and moſt magnificent ſpectacle is doubly overlaid with gold! upon it beam with effulgent glory, conſtellations of ſtars, and all the planets of our ſolar ſyſtem!—and in fine, the whole exhibits the appearance of a huge world floating in the incomprehenſible infinity of eternal ſpace!

The Balloon being full forty feet in circumference, if it was in reality what it appears to be, ſolid gold, it would weigh more than four millions of pounds.

*** A noble gallery, forty feet long, for accommodating the company who aſcends, is attached round the Balloon, and floats in the air with it; an improvement, replete with elegance and uſefulneſs, and never hitherto attempted or exhibited.

N. B. As the time is ſo ſhort, company will be admitted from Nine in the morning, till Five at night.

Vive le roi! et la reine!

At the earneſt Deſire of many hundred Perſons who were diſappointed, or who had not an opportunity of attending laſt Friday.

THE Curious are deſired to take notice, that THIS EVENING, the TEMPLE of HEALTH in Pall-mall, will be opened with all the celeſtial brilliancy of the new magnificent illuminations, and with a grand diſplay of the ſelf-moving muſical machinery of the new Celeſtial Bed. After which Dr. Graham will have the honour of delivering a curious and moſt eccentric Lecture on the prolongation of human life, healthily, uſefully, and happily, till the age of one hundred and fifty years. After the Lecture, a Grand Diſplay of the largeſt Electrical Apparatus in the world.

Thoſe Ladies and Gentlemen who have never ſeen this extraordinary place, nor heard or ſeen this ſtill more extraordinary Man, are now favoured with this laſt opportunity.

Illustration 28 Morning Post and Daily Advertiser, 6 Feb. 1784

Some entertainers took to the new competition with better grace than others. The Piccadilly conjurer Gustavus Katterfelto responded to balloons with his usual self-aggrandizement: he took out newspaper advertisements throughout 1783 and 1784 to boast that his alchemical fire-starter "Alarum" (likely phosphorous) was "more useful to the public in general than 30,000 Air Balloons." Never one to turn down an opportunity, however, Katterfelto also claimed that in fact *he had himself invented balloons* "15 years ago, at St. Petersburgh, which is as well known by the Russians, as his New Solar Microscope, and some of his other new discoveries are by the English" (*Parker's General Advertiser*, Dec. 24 1783).[86] Despite Katterfelto's bombast, his low opinion of ballooning's usefulness was not out of place in 1783, as I discussed in Chapter 2. As entertainment, however, ballooning rapidly integrated into London's entertainment culture. Soon, Katterfelto's ads began offering, for purchase, the secrets of ballooning. Katterfelto's own promised excursion into the upper atmosphere never materialized, though the self-styled Doctor nonetheless added it to his long and colorful résumé alongside his fictitious military accomplishments, medical degree, and fellowship in the Royal Society.

[86] For a biographical overview of Katterfelto's life and showmanship, see David Paton-Williams's *Katterfelto: Prince of Puff* (2008). Clare Brant also mentions Katterfelto and the many rumors that floated around him in *Balloon Madness: Flights of Imagination in Britain, 1783–1786* (2017). For a contemporary reference, see also Book IV of William Cowper's poem *The Task* (1785), in which Katterfelto is mentioned alongside "Ethereal journeys" in Cowper's description of London fashion. Coincidentally, Katterfelto left London to tour England around the time of *The Task*'s publication.

The satirical print shown in Illustration 29 embodies the British public's initial confusion about ballooning and the easy way a shady figure such as Katterfelto could entangle himself in its reception.[87] The dialogue represented in the print between Katterfelto and Montgolfier ("Monsier Montgolfier let us be reconciled.") suggests that there was some public quarrel between the two, but I have yet to find a contemporary or recent explanation of the print despite its being relatively well known among scholars of balloonomania. Context is insufficient even to identify which of the two Montgolfier brothers, Joseph-Michel or Jacques-Étienne, is intended. Neither brother had ever met Katterfelto; likely, they had never even heard of him. As a fixture of the London classifieds pages, Katterfelto was eminently recognizable, and other cartoons satirized his feuds with other philosopher-performers such as James Graham (of the Temple of Health and the Celestial Bed). Since this print was also published in December 1783, the same month as Katterfelto's claim to have invented ballooning first and scarcely months after the first manned balloon flights in France, the alleged dispute was likely entirely confined to the vivid imaginations of Katterfelto and a playful magazine eager for gossip.

Though the satire of this satirical print is disappointingly shallow, the print is actually remarkable for what it unintentionally reveals about the way the balloon

[87] This satire appeared in *The Rambler's Magazine* (1784–1791), which bears no relation to Samuel Johnson's similarly-named periodical *The Rambler* (1750–1752). Johnson lived through the first year of balloonomania before passing away in December 1784; he was unimpressed.

was initially understood in England. The two bare globes depicted in the print show only a minimal resemblance to the grandeur of the real Montgolfier balloon shown in Illustration 27. The artist seems to have drawn by word of mouth two aerial globes encircled by galleries, and the balloons are not accurately open at the bottom nor do they connect to the galleries in any obvious way. Then again, realism is not the strict purpose of this image; satire rules here, as it did when the Devil controlled the flying machine featured in "Dr. Musgrave's Machine" (Illustration 14). Katterfelto's infamous black cat sits atop his balloon, with the Devil flying on a broomstick in between.[88] Later in this chapter, I will return to flight's diabolical associations as well as the violin-playing monkey atop the Montgolfier balloon, but both details, like the presence of Katterfelto himself, suggest that ballooning seemed one entertainment among many in the popular culture of London. To carry mail, the usefulness of the balloon suggested by the cartoon's caption, seems entirely beside the point.[89]

[88] A popular part of his magic show, Katterfelto's cat was reputed to be a demonic familiar as well as an excellent marksman. A number of cats also accompanied aeronauts in the earliest balloon flights, though not, as depicted, on the top of the balloon.

[89] Although balloon flights were too unreliable to ever be employed in regular mail delivery, scores of balloons carried over a hundred passengers and nearly a dozen tons of mail out of Paris during the Prussian siege of 1870. The desperate circumstances of the siege outweighed the enormous dangers risked by the balloonists.

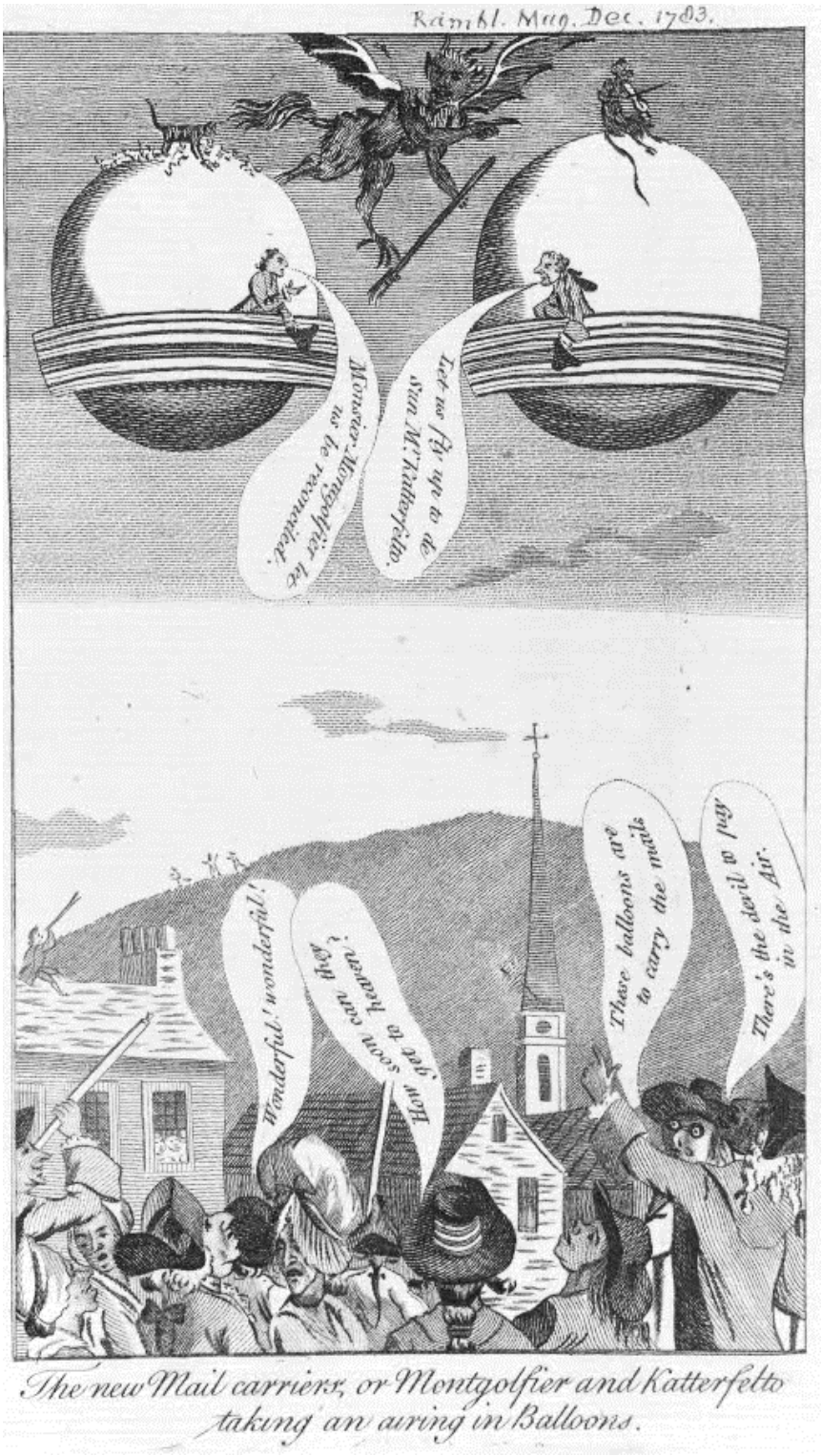


Illustration 29 "The New Mail Carriers, or Montgolfier and Katterfelto taking an airing in balloons" (1783)

Flight in the Theater

The flying machines discussed above circulated to varying degrees throughout Europe and throughout the long eighteenth century, but in their native milieu they are an oddity. Until the invention of ballooning, the undisputed home of flying machines was not on the drawing-board but on the stage. While a simple stage crane had been used in Classical theater to represent the elevated personage of a speaking god, stage machinery became increasingly elaborate and versatile throughout the long eighteenth century. In Chapter 2, I discussed the cloud-, chariot-, and moon-vehicles that introduce the (pretend) lunar court in Aphra Behn's *The Emperor of the Moon* (1687). The young lovers transform an abandoned building into a makeshift theater to cure Doctor Baliardo of his airy delusions; the machinery and conventions of the stage come ready-made for their performance. Surviving evidence indicates that *The Emperor of the Moon* was performed at least as late as 1748, but it was neither the first nor by far the last entertainment to embrace the machinery and magic of flight. In my research, I have identified roughly fifty-four separate flight-related theater pieces, overwhelmingly farces and pantomimes, between 1660 and 1800. In fact, although *The Emperor of the Moon* was a century old by the time of balloonomania, 1784 saw the play adapted into a new production named *Harlequin Emperor of the Moon*, which was performed throughout the 1780s, 1790s, and early 1800s.[90] Rather than being a self-contained

[90] Unfortunately, the text of this pantomime does not seem to have survived to the present day, but advertisements suggest that it was largely a renovated performance of the celestial masque that concludes the original play.

fad, balloonomania energized an interest in earlier representations of flight without regard for the differences between traditional images of flight and the new balloons.

From the Harlequin Doctor Faustus pantomimes of 1723 onwards, British pantomimes regularly had a distinctly magical quality, and this romantic aptitude both opened the stage to the possibilities of new technologies and shaped how those technologies were represented. Although the novel *Peter Wilkins* contained no explicitly magical elements and presented a mechanical explanation of the islanders' flight, the pantomime *Peter Wilkins; or, Harlequin in the Flying World* is a bewilderingly magical affair. The published summary of the pantomime diverges so far from the novel that it must be read to be believed, but the pantomime begins with the jealous sorcerer Irad inside a volcano, where a fiery spirit observes that

> A Desperate Mortal, of that new form'd race,
> On Batlike wings, who soars for love's disgrace
> Upon his flying Mistress, to obtain
> Vengeance now seeks our Magical Domain. (2)

As elsewhere, the effect, not the cause, was key to the spectacle of flight on the stage.

Taking the aerial theater of the eighteenth century on its own terms requires an openness to recognizing that flight, as I discuss in Chapter 1, existed on a continuum between the magical and the non-magical. The most famous flying character in early English theater is, after all, named Ariel, and both *The Tempest* itself and adaptations were performed throughout the eighteenth century. *The Tempest* was produced frequently during the mid-1780s, but the play had already

been extremely popular before the balloonomania fad. Newspaper advertisements for *The Tempest* are typically barebones affairs simply stating that the play had been performed the previous night to applause and would be performed again (standard puffery). Neither new machinery nor even new costumes are described, and a review of the play only noted that the music was laudable and the acting mostly passable (*Morning Post and Daily Advertiser*, 6 Dec. 1786).[91] The first balloon-era advertisement for *The Tempest* declares that the play "has not been acted these three Years," but this Drury Lane revival does not by itself prove a special, new public interest in the flying spirit Ariel (*Public Advertiser*, 6 Nov. 1784). After all, the play had also been performed at Drury Lane as recently as 6 Apr. 1782, making even "these three Years" a questionably generous reckoning. Other theater productions, one explicitly responding to the balloon fad, had premiered much earlier in the year, which suggests that producing *The Tempest* was not an attempt to strike while the aerial iron was hot. If a significant change had been made to the play's machinery in response to balloons, it seems all but certain that such a draw would have been noted somewhere. Given the extraordinary moment in which *The Tempest* was revived in 1784, the boring facts of that run-of-the-mill revival seem themselves bizarre and worthy of comment. Balloonomania did not demand a new Ariel; conventional flight thrived in the theater much as it always had.

[91] Generally unimpressed by the acting, the reviewer does note that "Mrs. Foster gave the songs of Ariel with the simplicity of taste" that distinguished her from "the other supporters of the scene [who] invited no conspicuous portion of admiration, and would perhaps be best advantaged by silence."

In the theater, flight largely remained magical even in an age when it had at last become technological. Over a decade after the first balloon flights, *Harlequin Captive; or, The Magick Fire* (1795) offered a conventional retelling of the legend of St. David and St. George in which Harlequin defeats a wicked sorcerer and his flying spirits with the aid of his own flying spirit named Ariel.[92] Flying spirits commonly appeared as a part of stage spectacles; consider the "aerial band" of spirits that defends Omai in *Omai; or, a Trip around the World* (1785) despite the fact that a real Omai existed, a real Pacific Islander named Mai (or Omai) who was in England from 1774 to 1776.[93] The taste for flight coincided with a taste for exotic cultures and faraway lands, and these all combined to perform ballooning entertainment as a playful new kind of witchcraft.

On some occasions, the flighty magic of the Harlequinade even joined the new, technological magic of flight on the stage. Witches were a familiar part of the eighteenth-century theatrical ensemble. While seventeenth-century witch plays such as Shakespeare's *Macbeth* (1606) and Thomas Shadwell's *The Lancashire Witches* (1681) continued to be performed in the eighteenth century, *Harlequin Doctor Faustus* shared the boards with such entertainments as *Witches; or,*

---

[92] There are a number of *Harlequin Captive* pantomimes in the eighteenth century. Most can obviously be eliminated as unconnected to the 1795 pantomime, but there is a 1736 pantomime called *The Fall of Phaeton; or, Harlequin a Captive* that is probably unrelated but likely shares an aerial theme.

[93] Although Omai's aerial spirits go unnamed, compare with the guardian sylphs of Alexander Pope's *The Rape of the Lock* (1712–1714). The illustrations accompanying *The Rape of the Lock* depict diminutive putti quite unlike earlier descriptions of Paracelsian sylphs (as the high burlesque itself deliberately falls short of the Classical abduction of Helen).

Harlequin Cherokee (1715), *Witches; or, A Trip to Naples* (1771), and *Pantomime Lancashire Witches; or, The Distresses of Harlequin* (1783).[94] As these titles suggest, witches in pantomime are often associated with travel, but, unlike Faust, eighteenth-century pantomime witches often play the positive role of helper figures to Harlequin. Perhaps as a comment on these tendencies, a witch in *Pantomime Lancashire Witches* offers an unusual critique of ambition abroad when she sings to Harlequin: "Let others dangerous seas explore, / Thou shalt behold the storm from shore. / . . . / Let others risk a watery grave, / Who after faithless riches crave, / Who health and all its joys resign, / For glittering trash from Indian mine" (3–4). The surviving text of the pantomime does not indicate whether Harlequin agrees to the witch's pleas, but the witches bless him in any case.[95] They tell him to "depart, / Fearless—for by our potent art / Firm rocks thou'lt move—loud tempests still, / And bend all nature at thy will" (4). Presumably, Harlequin receives his usual magic bat from the witches, but this particular text is especially scant.[96] By contrast, another witch pantomime from the following year, *The Vicissitudes of Harlequin*

---

[94] A student of John Rich, Charles Dibdin became one of the most prolific authors of pantomime. His *Pantomime Lancashire Witches* draws on Shadwell's *The Lancashire Witches*, which in turn drew on the Caroline play *The Late Lancashire Witches* (1634) by Richard Brome and Thomas Heywood.

[95] Unfortunately, no newspaper review of the pantomime survives if one ever existed. Newspaper references to pantomimes are typically advertisements rather than reviews, which were much rarer. In my reading, newspaper reviews seem an erratic marker of distinction rather than a reliable gauge of quality or literary merit.

[96] The text consists of only brief songs and recitative for a witch, a seller of second-hand clothes, and the concluding wedding celebration of Harlequin and Columbine, who otherwise do not explicitly appear in the text. The standardized plot of the Harlequinade allows readers to make some inferences about the intervening actions.

(performed 1784; published 1790), offers remarkable detail in its recitative and printed descriptions of the action.

Both *Pantomime Lancashire Witches* and *The Vicissitudes of Harlequin* were performed in 1784, the greatest year of English balloonomania, and both include nods to the craze even while holding on to traditional aerial motifs. In *Pantomime Lancashire Witches*, a seller of second-hand clothes notes the fleeting airiness of fashion as he notes how "This bonnet, called an air balloon, / That hid some fair one's nose, / May shew the tastiest fashions soon" go out of style. Despite the existence of air balloons, however, Harlequin himself bends his "course / Through air upon a flying horse" (4). Pegasus still seems to have a place in the world post-1783. *Vicissitudes* goes further and mixes witchcraft and ballooning outright. The witches bless Harlequin with their power over "Spirits in Wind, in Sea, or Air" and give him his magic sword before they "fly / Thro' the wide unbounded Sky" on their "sticks" (likely broomsticks but possibly other implements, such as switches) (3–4). If Harlequin waves his sword, the witches promise, he will "travel swifter than the fleeting Wind; Through this, with speed, you'll every Wish obtain / And to the Summit of Ambition gain" (4). To travel rapidly from scene to scene is Harlequin's most standardized magical ability, and here it is represented as an aerial power. By the end of pantomime, however, Harlequin's sword is superseded by a modern alternative: the balloon itself.

As I discussed at the beginning of this section, genuine balloons did find some limited application in the theater, but even a theatrical imitation of a balloon was

assisted by the theatricality that surrounded the real balloons that journeyed through the air. The witch promises Harlequin that "from [Pantaloon's] Vengeance soon we'll take you far, / And waft you in a new invented Car" (13). A descriptive passage reveals "Harlequin and Columbine in a triumphal Car drawn up into the Clouds by an Air Balloon, made in imitation of that which Messrs. C— and R— exhibits in Paris" (13).[97] Jacques Charles did not fly after his first experiments in late 1783, but balloons, even stationary, even deflated, could become relics of aerial adventures attractive to crowds.[98] I will return to balloon exhibitions and *Vicissitudes* later in this chapter. For now, however, I note how easily the balloon slips into its place as the machinery of the pantomime.

This machinery is literal as well as figurative. After the balloon escape of Harlequin and Columbine leaves Pantaloon and his minions "astonished," a witch tells Pantaloon that "To Cross their Love you strive in vain; / Such firm Support from us they gain; / Spirits who rule the Sea and Air, / Make Harlequin their special Care"

---

[97] Likely the famed inventor of the hydrogen balloon, Jacques Charles (1746–1823), and one of his engineers Nicolas-Louis Robert (1760–1821), who are shown filling a balloon with gas in Illustration 5. A more famous R of early ballooning is Jean-François Pilâtre de Rozier, first pilot of the Montgolfier hot air balloon, but the *Vicissitudes* text was published in 1790, and de Rozier perished in a ballooning accident in 1785. While it is possible that the 1790s text is reproducing an earlier, now-lost edition of the 1784 *Vicissitudes*, the known professional relationship between Charles and Robert makes them the most likely identifications for "Messrs. C— and R—."

[98] In *Falling Upwards: How We Took to the Air* (2013), Richard Holmes touchingly recounts the "pilgrimage" French journalist Wilfred de Fonvielle made to England in 1867 to visit the retired balloonist and self-described "Ancient Mariner of the Upper Atmosphere" Charles Green and the remains of his famous *Nassau* balloon (195–197). In *The Dominion of the Air* (1903), J. M. Bacon offers a more negative representation of this "pathetic interview" (194).

(13–14). The pantomime, like the audience, has little interest in drawing distinctions between the spectacles of magic and those of science; in their effects, they appear the same. Indeed, Harlequin's departure in a balloon is followed, without explanation, by "a Monkey, habited as Jupiter" who "descends in a Car drawn by an Eagle and alights in the Middle of the Stage. The Monkey dismisses the Car, and it rises into the Air" (14).[99] The parallel presentation of the air balloon and the celestial car smooths the otherwise abrupt transition between the grotesque Harlequinade and the Classical portion of this pantomime.[100]

These fusions and confusions are not a mere detail of this pantomime; they are a full-fledged feature of the entertainment. As the serious part of the pantomime, this mythological section is undermined both by Jupiter's portrayal by "a Monkey" (likely a human actor as the "Monkey" speaks lines) and by subsequent scenes in which all the characters are portrayed by cats, dogs, and "a she Monkey dress'd as Europa" (14).[101] Rather than having clearly defined serious and comic sections, *Vicissitudes* represents what Kate Novotny Owen calls heterogeneous mixing, "in

---

[99] Jupiter transformed himself into an eagle in the myths of Ganymede and Aegina, and the eagle, a large apex predator, represented imperial power in Roman symbolism and German heraldry.

[100] In Chapter 4, I examine balloon-enthusiast Percy Bysshe Shelley's later use of a magic car in the philosophical poem *Queen Mab* (1813).

[101] For standard accounts of the pantomime's division into serious Classical and comic grotesque sections, see Mitchell Wells's "Some Notes on the Early Eighteenth-Century Pantomime" (1935), John O'Brien's *Harlequin Britain: Pantomime and Entertainment, 1690–1760* (2004), Lance Bertelson's "Popular Entertainment and Instruction, Literary and Dramatic: Chapbooks, Advice Books, Almanacs, Ballads, Farces, pantomimes, prints and Shows" (2005), and Daryl Domingo's "'The Natural Propensity of Imitation': or, Pantomimic Poetics and the Rhetoric of the Augustan Wit" (2009).

which each original part remains distinct and recognizable, like different colored marbles tossed in a bag" (504). In this theatrical culture, different attractions were referenced, stolen, and exchanged. The animal antics of *Vicissitudes* imitated the trained dogs that imitated people in a popular show at Astley's Amphitheater, one example of the entertainment current in which balloons freely circulated.

The coincidence of the ballooning rage and the fashions of the stage also appeared on the advertising page. Announcements of balloon launches and exhibitions regularly appeared in newspapers alongside advertisements for pantomimes and other popular entertainments. Previously in this chapter, I examined a pantomime, *The Vicissitudes of Harlequin*, that saw Harlequin escape from the pursuing Pantaloon in a balloon given to him by witches. After a successful series of performances in the summer of 1784, the pantomime returned to the Royal Circus in the fall with a new song, "the favourite Ballon Song, by Mr. De Castro" (*Parker's General Advertiser and Morning Intelligencer*, 2 Oct. 1784). Unfortunately, I cannot with certainty say anything about this song as it seems not to have been included in the text of the pantomime published in 1790. The advertisement for the new song, however, Illustration 30 shown below, suggests a reason for the revival of this particular pantomime. A balloon-minded citizen in October 1784 could have viewed Vincenzo Lunardi's famous balloon, the man himself, and even the animal companions that had joined him in his celebrated flight over Finsbury a few weeks

earlier, in September.[102] The Pantheon in Oxford Street closed at dark, but the Royal Circus across the river conveniently opened at sunset, so committed balloonomaniacs could have further sated their obsession with a balloon pantomime (complete with flying monkey). From the beginning, balloon launches joined in the pageantry and showmanship of the theater, and this taste for spectacle shaped what was ostensibly a scientific enterprise. The *Vicissitudes'* mixing of the real and the fantastic, the high and the grotesque, the ancient and the modern, was not only typical of pantomime but of ballooning itself.

[102] Finsbury itself was incorporated into London in 1900, but at the time was home to the Finsbury Artillery Ground, which is mentioned in the ad shown in Illustration 30. Despite its warlike name, the Artillery Ground had no military connection and was chiefly a cricket venue throughout the eighteenth century.

ROYAL CIRCUS.

THIS EVENING will be presented

A Burletta, called

OLD ROBIN GRAY.

HORSEMANSHIP,

By Mr. HUGHES and PUPILS.

Dancing by Meſſieurs Labotie and Flin, the two Miſs Simonets, and others.

To which will be added, a new Pantomime, called

The VICISSITUDES of HARLEQUIN.

In which will be introduced the favourite Balloon Song, by Mr. DE CASTRO.

The Muſic of the Recitative and Songs compoſed by Mr. Brooks.

With entire New Scenery by Signor Novoſielſki.

The Dreſſes and Decorations by Signor Lupino.

To conclude with a

SUPERB FIRE WORK,

By Signor ROSSI.

Boxes, 3s. Pit, 2s. Gallery, 1s.

The doors are to be opened at half paſt Five, and the Performances to begin at half paſt Six o'clock.

Places for the Boxes to be taken of Mr. Thompſon at the Circus, in St. George's Fields.

N. B. To prevent confuſion it is requeſted the Ladies and Gentlemen will order their Coachmen to ſet down and take up with their horſes heads towards the Turnpike.

COALS, at 32s. per Chaldron.

ARNOTT and Co. Coal-Merchants, ſell at the above low price, the very beſt ROUND COALS, 13 Sacks to the Chaldron, inſtead of 12, uſually ſold, ſent to any part of the town, (for ready money) or in the coun-

PANTHEON.

The EXHIBITION of Mr. LUNARDI's BALLOON IS opened at the PANTHEON, where it is to be ſeen in the exact ſtate it was in when Mr. LUNARDI deſcended at Collier's Hill, near Ware, in Hertfordſhire; and as every circumſtance, though ever ſo trifling or minute, is intereſting, when connected with a great and important adventure, the curious will be gratified with the ſight of the two little animals (a Cat and Dog) which ſhared with him the dangers of that hazardous and uncommon voyage. Mr. Lunardi will attend perſonally, from twelve to four o'clock, for the ſatisfaction of thoſe who may wiſh to ſee and converſe with him.

Admittance to the Pantheon One Shilling.

The Public are likewiſe informed, that in compliance with the general wiſh of people of the firſt rank and fortune at the Weſt-end of the Metropolis, as well as the moſt reſpectable Merchants and Individuals in the City, that a Subſcription ſhould be opened for Mr. Lunardi, not only as a teſtimony of their approbation of his merit, but to defray the expences of his firſt voyage, and make amends for the advantages taken by the neighbourhood of the Artillery Ground, on the day of his aſcent, that Subſcriptions are accordingly opened at the following places, viz.

New Lloyd's Coffee-houſe.
Brookes's and White's, St. James's-ſtreet.
Debrett, and Stockdale's, Bookſellers, Piccadilly.
The London Coffee-houſe, Ludgate-hill.
The Parliament-ſtreet Coffee-houſe.
And at the Pantheon.

N. B. All Letters, Meſſages, &c. intended for Mr. Lunardi, are to be left at his houſe, No. 6, Poland-ſtreet, or at the Pantheon.

☞ The Pantheon is open from Eight o'Clock in the Morning until dark.

Illustration 30 Parallel Ads for Harlequin and Lunardi (1784)

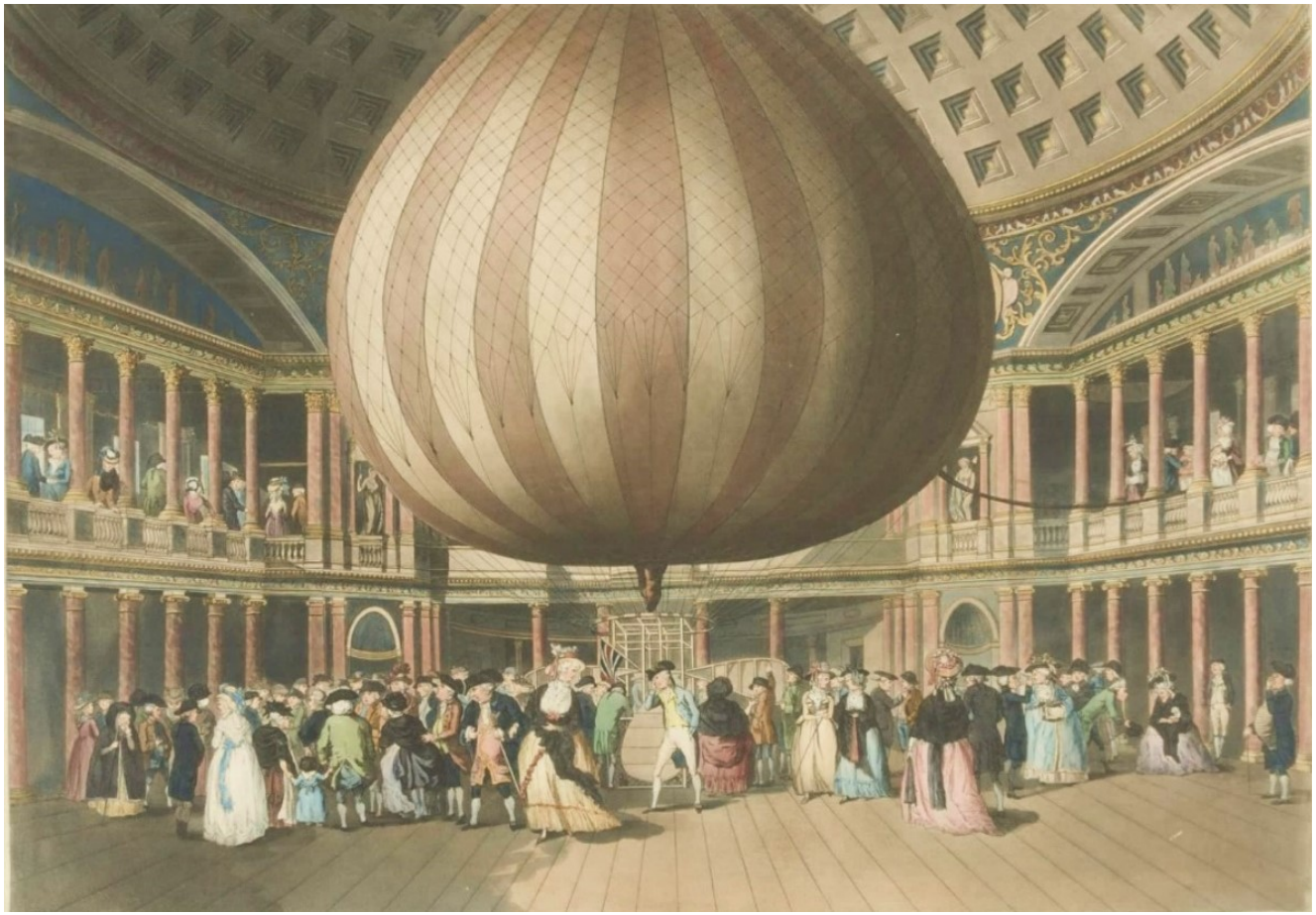


Illustration 31 "A Representation Of Mr. Lunardi's Balloon, As Exhibited In The Pantheon" (1784)

Omai; or, A Trip round the World was prompted by real-world events of the 1770s, but the British taste for exotic culture on the stage had long drawn on the Ottoman Empire, an expansive neighbor closer to home than the South Sea. While ships slowly ferried people, goods, and culture between lands, balloons in the 1780s promised the realization of what had long been imagined with magic: rapid, seemingly instantaneous travel from place to place. Inchbald's farce had imagined hapless Britons swept abroad in a wayward balloon, but a new pantomime that premiered early the following year saw this movement reversed, from Arabia to England and back again, in *The Magic of Orosmanes: or, Harlequin Slave and Sultan.*[103] In this pantomime, the audience discovered two characters of traditional English pantomime, Harlequin and the Clown, transported to a setting out of the *Arabian Nights.*[104] Harlequin and the Clown are sold as slaves to the Sultan, but, as ever, Harlequin triumphs over his enemies and marries his Columbine (here named Zulma). In *Stranger Magic: Charmed States and the Arabian Nights* (2012), Marina Warner argues that "flight distinguishes the fantasies of [the *Arabian Nights*], which present a more democratic view of flying: the jinn and peris are constantly aloft, and

---

103 The pantomime was advertised in 1785 as *The Talisman of Orosmanes; Or, Harlequin Slave and Sultan* but published under the revised title in 1790. In the published text of the pantomime, Harlequin receives three magic objects from Orosmanes, but none of them stand out as the titular talisman. The pantomime may have been revised before publication, or the change in the title could be meaningless.

104 The published pantomime's title page declares that it is "A Pantomime drawn from the Arabian Legends." The pantomime includes the seraglio, janissaries, a dwarf, and other broadly Oriental features rather than following a specific story from the *Arabian Nights*.

they frequently carry off the human protagonists too" (332–333). Throughout this *Nights*-inspired pantomime, Harlequin is aided by the magic of flight.

Magic, especially the magic of transformation, marks traditional Harlequinade, but aerial magic particularly inflects *The Magic of Orosmanes*. After Harlequin is enslaved, he considers killing himself in a comic scene that is interrupted by a vision of his royal father, Orosmanes, who declares that Harlequin is his long-lost son and a prince who will wed the Sultan's daughter Zulma. The text does not specify of what land Harlequin is prince, but Orosmanes was the tragic-heroic Sultan of Jerusalem in Voltaire's popular play *Zaïre* (1732). Aaron Hill's English adaptation, *Zara*, was performed scores of times between 1735 and 1796, including at least half a dozen times in 1784. The name Orosmanes (anglicized as Osman in Hill's adaptation) was likely meant to be typically Oriental rather than the identification of a particular character. Harlequin's rival in the pantomime is named Osmyn, and both Orosmanes and Osmyn both likely derive from the name of a historical sultan, Osman I, founder of the Ottoman dynasty.[105] This Orosmanes, however, has more to do with Solomon than with the historical Osman or the literary Orosmanes, for he "appears attended by two Genii" (5), and mastery over elemental beings, especially of aerial beings, is a hallmark of magical authority in the *Nights.*

[105] In the final scene of the pantomime, Zulma's father seems to be named Amurath and seems to have perished, leaving Harlequin the opportunity to become Sultan Achmet. These names too seem to be intended as representative rather than historically specific.

Although the sparse stage directions for *The Magic of Orosmanes* do not indicate how exactly Orosmanes and his jinn servants "appear," they most likely floated above the stage with the aid of a crane. For several weeks in 1785, recurring advertisements in the *Morning Post* (e.g., 25 Mar. 1785), the *Public Advertiser* (e.g., 26 Mar. 1785), and the *General Advertiser* (e.g., 07 Apr. 1785) announced that the "Grand Grotesque Pantomime" featured "a superb Variety of Scenery and Machinery." Elevated figures traditionally represented divine and magical beings, and Orosmanes seems to have been transported (perhaps in body but likely only in spirit) by his aerial attendants to appear as a vision to his despairing son. Harlequin performs various magic tricks throughout the pantomime, such as creating a magic pigeon to fly with a love letter to Zulma. When Harlequin makes two jugs of wine disappear into thin air beneath the noses of two janissaries and a dervish, the dervish takes credit for the miracle and berates the janissaries for their impiety in drinking wine.[106] Harlequin is not the only magic-user in the story, but, like Moses in the court of Pharaoh, his magic ultimately wins out over interlopers.

The magical effects of the pantomime would have been familiar to regulars of London's diverse entertainment scene. The magic pigeon effect in particular must have been remarkable because advertisements announced it alongside such spectacular effects as "two Automaton Figures; one of which postures on the Tight

[106] The text notes the entrance of the dervish as "a Dervise comes on" (10). Given the spectacular nature of pantomime, it seems likely that the character is made recognizable as a dervish by performing the famed whirling dance, perhaps even levitating as dervishes were reputed to do. Without further evidence in the text, however, that is as far as I will speculate.

Rope in the Form of a Monkey; and the other imitates wonderful and surprising Sagacity of the Learned Pig" (*Public Advertiser*, 1 April 1785). The learned pig performed arithmetic and other cognitive tricks in and around London from 1784 to 1788 and attracted the amusement and annoyance of such figures as James Boswell, William Blake, and Thomas Rowlandson. As for the monkey, funambulism had been a part of English spectacle for centuries. In *Mathematicall Magick* (1648), John Wilkins discusses how "Funambulones, or Dancers on the Rope" would "attempt somewhat like to flying, when they will with their heads forwards slide downe a long cord extended; being fastened at one end on the top of some high Tower . . . with wings fixed to their shoulders" (207).[107] Both tightrope and slackwire walking were regular part of the performances at Astley's Amphitheatre, alongside the performing dogs parodied in *The Vicissitudes of Harlequin*. The monkey imagined playing a violin atop Montgolfier's balloon in Illustration 29 has no connection to the historical Montgolfier brothers but fits comfortably into the entertainment culture of eighteenth-century London. The pantomime not only mixes serious with comic sections; it mixes up all the various entertainments available to its audience.

Harlequin as well as the audience seem destined to experience the pleasures of the British metropolis, and, pursued by his enemies, Harlequin uses his magic to transport the party from Arabia to Covent-Garden. Comic episodes follow in which heroes and villains alike do battle with fruit merchants, chimneysweeps, chairmen,

[107] For more on the history of rope-walking in Europe, see Clive Hart, *The Prehistory of Flight*, 126–128.

and a performing Haymarket magician, likely in parody of the sorcerer Katterfelto himself.[108] Astley's Amphitheatre also featured a recurring piece called "Philosophical Amusements; Or, The Magical Table," and other possible identifications include the mind-reader Philip Breslaw and Joseph Pinetti, who had devised the magic tricks used in *The Magic of Orosmanes*. In 1784, under the heading of "AIR BALLOON," an advertisement had announced the publication of *Breslaw's Last Legacy; or, The Magical Companion*, "a book of real knowledge in the art of Conjuration. In which is displayed, the way to make the AIR BALLOON and INFLAMMABLE AIR," in which "is more particularly described than in any other Publication of a similar nature how to make the AIR BALLOON, so that the curious may amuse themselves and Friends by displaying them either in public or private" (*General Evening Post*, March 30, 1784). Pinetti offered a similar book of tricks that was advertised on the same page an ad for a Breslaw performance and a long description of Zambeccari's exhibition of a "truly magnificent aerial vehicle," which I discussed earlier in this chapter (*General Advertiser*, 24 December 1784). While the flights of *The Magic of Orosmanes* are less explicit than those of *The Vicissitudes of Harlequin*, *Orosmanes* directly portrays a London theater culture in which flight—magic, scientific, theatric—was a leading spectacle.

---

[108] Charles Dibdin, the author of *Orosmanes*, had previously satirized Katterfelto as "Dr. Catterpillar" in *None are so Blind as those who won't see* (1782). According to Paton-Williams, Katterfelto's newspaper advertisements raged at the character for nearly a decade (56–57). Paton-Williams also notes a later production with the intimidating title *The fatal Overthrow of Abobecocracoponocopifficacokatterfelto, King of the Antipodeanns* (1784).

The published description of the pantomime's final confrontation is disappointingly vague, but some inferences about its nature may be drawn from the theatrical context in which it was performed. Although Harlequin triumphs in the London interludes, his enemies succeed in capturing Zulma and the Cloud, and the whole cast returns to a desert setting. Harlequin "watches his opportunity" and "pours" his magic drops onto Osmyn's head, perhaps flying over his enemy to do so (14). The drops summon a dragon, of whose entrance it is only said that the "Dragon comes on" (14). This greatest of winged beasts likely resembled the spectacular dragon that appears at the end of *The Necromancer*. The advertisement for Pinetti's book of tricks, including the tricks known to be included as part of *The Magic of Orosmanes*, also indicates that Pinetti knew several tricks for igniting and extinguishing candles from a distance as well as manipulating objects with wires (*General Advertiser*, 24 December 1784). It seems reasonable, therefore, to imagine that the dragon likely flew and breathed fire, combining several common tricks of eighteenth-century spectacular theater.[109] Finally, Harlequin's subsequent ascension to the throne is proclaimed with "music [to] fill the air around . . . while to heav'n our voices raise" (15). In the midst of balloonomania, of triumphs in the air above London, the public taste for new, more fantastical flights in the theater was alive and well.

[109] For information on the uses of pyrotechnics in early-modern English theater, including four period diagrams of fire-breathing dragon machines suspended on lines, see Philip Butterworth's *Theatre of Fire: Special Effects in Early English and Scottish Theatre* (1998).

The eighteenth-century boasts a vibrant, bizarre aviary of memorable flying machines and beings. These images and others like them demonstrate the erratic circulation of multiple competing ideas of what constituted progress in the development of a flying machine. The balloon was the most successful of these ideas, but we must take care not to take its invention as an isolated or an inevitable outcome in eighteenth-century science. In its own age and afterwards, the balloon was recognized as a new development but a new development within an older tradition. So strong was the drive to incorporate the balloon into that tradition that the real details of flight were commonly disregarded, and, in some cases, mistakes were made. Illustration 32 shows two ceramic plates, part of a larger set of nineteenth-century dishware commemorating the history of flight. In these plates, as in Illustration 5 at the beginning of this chapter, no distinction is made between plates showing imaginary flying machines, such as those in Illustration 32, and plates depicting real flying machines flown by real people such as the Blanchards. The designs of the plates in Illustration 32 are clearly drawn from the illustrations in Restif de la Bretonne's novel *La Découverte austral par un homme volant, ou Le Dédale français* [*The Discovery of Australia by a Flying Man, or, The French Daedalus*] (1781, one illustration from which is shown in Illustration 33).[110] Somehow, real

[110] Although sometimes described as an imitation of Paltock's *Peter Wilkins* (and doubtless it is to a degree), the novel is extremely strange and largely very different from the more conventional Robinsonade of *Peter Wilkins*. Other, more grotesque hybrid tribes illustrated in the novel include serpent-men and elephant-men.

people belong to the same class of early flights as illustrations from a bizarre French novel of strange flying machines and islanders with the heads of sheep.

Illustration 32 Ceramic Plates (1800s)

Perhaps most notably of all, the plates are outrageously mislabeled in a final blurring of reality and fiction that all merges into an all-encompassing aerial tradition. The plate on the left reads "Besnier 1768." Not only did Besnier not design such a flying machine (cf. Besnier's hinged paddles in Illustration 16), Besnier reported flew in 1678, not 1768. The transposition of the digits reflects the general

confusion that reigns in the early construction of an early history of human flight. The plate on the right raises even more questions. The plates must belong to a set, yet the image again draws from Restif's *La Découverte austral* [*The Discovery of Australia*]. The plate is now correctly labeled, but I am at a loss to explain how the year 1800 came to be paired with the novel, which was written by Restif, not Godwin as the plate reads. Godwin and his geese could not be the source of the 1800, as his *The Man in the Moone* was published a century and a half earlier (see Illustration 10). None of these errors are isolated incidents. In 1786, the biographer John Ireland mentions "Peter Wilkins' Voyages to the Moon" in a sentence that implies that Peter Wilkins was an author rather than a fictional character (who did not go to the moon) (48). A painted tile based on Lana's unusual 1709 flying machine is mislabeled "*Expérience d'un dirigible 1782*" ["Experiment of an airship 1782"]. Even today, art depicting early flying machines frequently mislabels those machines, and fictional flying machines and flying machines imagined but never built are presented as though they were real machines. I suspect we enjoy the novelty and creativity of these designs as well as a feeling of superiority in how far our technology has progressed. Understanding early flight requires us to give up some of that superiority, to understand the irregular courses of early science. We can still experience, however, and now experience with deeper pleasure, the inventiveness of an age where the dream of flight was free to assume such a splendid array of forms. In the following chapter, I explore how one especially majestic form of flight, the cosmic voyage, resisted the decline of ballonomania.

Illustration 33 La Découverte australe [The Discovery of Australia] (1781)

Chapter 4. Cosmoscope: Visions from a Distant Star

birds unknown

Unknown, not unpercievd, spread in the infinite microscope,

In places yet unvisited by the voyager. and in worlds

Over another kind of seas, and in atmospheres unknown

—William Blake, *Visions of the Daughters of Albion*

In 1968 in orbit around the moon, Apollo 8 astronaut William Anders captured the first full-color photograph of Earth from space. The resulting photograph, "Earthrise," was later named one of *Time* magazine's "100 most Influential Images of All Time" and was credited with helping "to launch the environmental movement." Anders's photograph shows Earth rising over the surface of the Moon. The brilliant blue-white planet contrasts sharply with the gray ruin of the lunar wastes and the black, starless darkness of space in the image. This powerful composition suggests the fragility and preciousness of our planet, the only know harbor of life in the universe, and the "Earthrise" photograph remains an important symbol of environmental advocacy, in this way blurring the boundary between science and politics. Centuries before the Apollo missions, authors imagined cosmic voyages that carried characters to worlds far beyond Earth. Before

and after the development of manned ballooning in 1783, human flight promised profound changes in human society, and social critics imagined that the world itself would appear radically different when viewed from above.

By the end of the eighteenth century, the moment of balloonomania had passed, and the first real flying machines had failed to live up to their supposed potential for peacefully or perniciously transforming the world, which carried on much as it had before humanity first took to the air. Still, dreams of flying, sometimes even flying to distant worlds, had existed long before the invention of the limited balloons, and these dreams continued even as the balloons were absorbed back into the earthly world of spectacular entertainment. Exhaustive histories of nineteenth-century ballooning and aviation are readily available elsewhere because these are the periods traditionally associated with the birth of human flight or the precursor to the birth of heavier-than-air flight. Instead, in this final chapter, I am chiefly interested in how little one subsection of the great chart I introduced in Chapter 1 changed over the course of the long eighteenth century, including the decades after the discovery of ballooning. Here I argue that authors writing from one aerial perspective, the cosmic perspective, promised a uniquely clear, coherent view of worldly affairs. Antiaerial writing saw flight as a warping, dangerous force, but flight could intellectually serve a higher purpose than spectacle. From the seventeenth century onwards, the philosophical expanding of the universe expanded, bringing with it a secularization of the eternal perspective once only attributed to God.

Politics, religion, and other earthly controversies might appear inscrutably complex because we observe them while in the thick of their influences, but Enlightenment philosophy abounds with outside observers who see with vision unclouded by familiar entanglements. Michel Foucault went so far as to call outside observers—"the foreign spectator in an unknown country, and the man born blind restored to light"—"the two great mythical experiences on which the philosophy of the eighteenth century had wished to base its beginning" (78). To these tropes I add another thought experiment common to early flight narratives: an observer transported beyond all countries and blessed with more-than-mortal sight. Here, the sublime lies not in deep obscurity but in supreme clarity. Because a viewer positioned at this ultimate point could view and comprehend the entire cosmos, I call this imaginary vantage point the cosmoscope. Enlightenment authors including Percy Bysshe Shelley and others discussed in this chapter imagined that complex matters would appear simple and accessible to human understanding if they could be viewed from above, from an imaginary position in outer space. Even more than the views from balloons, cosmic voyage literature commonly imagined a higher, transcendent view of the universe.

Although authors and philosophers gave tremendous consideration to the material and social consequences of human flight, the preoccupations discussed in earlier chapters left oddly little attention for looking down. Margaret Cavendish's bird-men in *The Blazing World* do not seem psychologically different from the bear-men or their other grounded counterparts, but one might expect that their world-

views, derived from different natural powers and different bodily experiences, should be fundamentally different from one another. Likewise, the philosophers of Jonathan Swift's flying island look up for astrological premonitions while unchecked innovation ravages their country-side below. For all the attention paid to the wings of birds, the birds-eye view remained aloof, distant; eighteenth-century cartography benefited more from the invention of more sophisticated survey instruments, including improved telescopes and chronometers, than from the late invention of unreliable flying machines. On theater stages, flight represented superhuman powers transporting characters from place to place. In all these cases, the imagined flyers seem preoccupied with what they are doing or where they are going, rarely dwelling on where they are. By contrast to these travelers, characters journeying through outer space can take advantage of extraordinary vantage points to show readers the world below in a new light, making such stories ready vehicles for thoughtful critique of the terrestrial order.

Menippean Satire and the Cosmoscope

As a literary model, the cosmoscope works best when both mortal narrator and supernatural operator exist within the world of the story. An argument might be made that the author describing the cosmos and interpreting the imagined view for a reader might constitute a kind of cosmoscope. This type of story, however, could only rarely be distinguished from Menippean satire more generally, a form Northrop Frye describes as "a vision of the world in terms of a single intellectual pattern" and a "free play of intellectual fancy and the kind of humorous observation

that produces caricature" (310). In Chapters 1 and 2, I introduced Menippean satire at length as a literary mode ideally suited to the imaginative resources of human flight, and some satires, such as Lucian's second-century *True History* and *Icaromenippus,* even include flights to the moon and beyond. Although these imaginary voyages do travel to strange and distant countries, they are in general extremely similar to more earthly voyages to imaginary (but still terrestrial) lands. I discussed Margaret Cavendish's Blazing World in Chapter 1 and Jonathan Swift's floating island Laputa in Chapter 2, but both of these stories offer a vantage point not profoundly different from Robert Paltock's extraordinary but grounded island, which I discussed in Chapters 2 and 3. The cosmoscope-type cosmic voyage requires an extreme remove from ordinary experience, and voyages to the moon often remain deeply enmeshed in the sublunary world below.

The cosmoscope form presents vast truths about the universe studied as a whole, while less cosmologically ambitious voyages constrain themselves to a narrower focus. Before he corrected Swedenborg's cosmology with *The Marriage of Heaven and Hell*, William Blake drafted the fragmentary satire *An Island in the Moon* (1784), written in the thick of English enthusiasm for manned ballooning. In this story, Blake has no pretension to encompass eternity; he writes of England. "In the Moon, is a certain Island near by a mighty continent, which small island seems to have some affinity to England. & what is more extraordinary the people are so much alike & their language so much the same that you would think you were among your friends" (449). Blake's own friends (and enemies) have found immortality in the

countless scholarly attempts to identify real persons intended by Blake's cryptic names—Suction the Epicurean, Inflammable Gass the Windfinder, Miss Filligree Work, with her fashionable "Balloon hats" and her "sorrows of Werter" (457). The history of these identifications is too long and ultimately inconclusive to recount here. Wide-ranging, frequently vulgar, and above all joyfully rambunctious, the *Island* teases popular and intellectual fashions, and the moon is a mirror, not a cosmoscope.

The cosmoscope is not aesthetically superior to the moon-as-mirror type of cosmic voyage, and the latter is far more common than the former. Francis Godwin's *The Man in the Moone* (1638) explored religious politics and the philosophy of language among the Lunars, whose king, Irdonozur, is impersonated as Iredonozar in Aphra Behn's *The Emperor of the Moon* (1687). Godwin's fictional protagonist, Domingo Gonsales, reappears in Cyrano de Bergerac's *L'autre monde* (1657). Socrates too appears in de Bergerac's tale, echoing his appearance in the celestial satires of Lucian. Earthly concerns and earthly persons populate the moon. Extraterrestrial protagonists are extraordinarily rare among the rich array of cosmic voyages, with one of the few examples being Voltaire's Micromégas, a giant from a planet orbiting the star Sirius.

Even this alien being turns out to be surprisingly familiar despite his distant origins. He has studied such earthly authors as Euclid and Blaise Pascal, and Voltaire measures Micromégas in earthly quantities: "vingtquatre mille pas géometriques" [twenty-four thousand geometric steps] tall and "quatre cens cinquante ans" [four

hundred and fifty years] old (2–3). Although not as earthy as Gargantua and Pantagruel, the giant Micromégas and his companion from Saturn (who is a mere "*six mille piés de haut*" [six thousand feet tall]) prove themselves cosmopolitans (6). After striding indelicately across the earth, the giants at least discover humans, and Voltaire uses their conversation to rail against the smallness of human vanity and to praise the immense power of human reason. In all these cases, however, the cosmic voyage seems incidental rather than necessary to the satirical perspective.

Not all cosmic tourists use the cosmoscope; they bring perspective but not a cosmic perspective. In the third 1786 collection of outrageous adventures of Baron Munchausen, the Baron travels to the moon on a magic beanstalk to retrieve his lost hatchet. Unable to climb down again, the Baron drops back down to earth, but his fall makes no impact beyond the resulting crater. The Baron himself is unchanged and unreflective on his extraordinary experience. In another tale reminiscent of Elizabeth Inchbald's *The Mogul Tale*, Munchausen shoots down a runaway balloon while in Constantinople. The grateful traveler has ascended the firmament past the moon, yet he too returns to earth none the wiser.[111] Finally, Munchausen, in a fit of mischief, suspends the College of Physicians in the air for three months, during which time the death rate plummets because there are no doctors to abuse their patients. Here, the narrator offers a small glimpse of the world's workings from

[111] In parody of contemporary experiments, however, the wayward aeronaut has devoured the sheep he had intended to study as research on respiration in the upper atmosphere.

above, but Munchausen's flights in general are erratic and unfocused, unlike the special perspective of the cosmoscope.

Likewise, not all systematized views from an outside, even a cosmic outsider, necessarily qualify as examples of the cosmoscope. Drawing on the same tradition of Menippean satire, are the starry goddess of justice, Astrea, in Delarivier Manley's *The New Atalantis* (1709) and the Chinese traveler Lien Chi in Oliver Goldsmith's *The Citizen of the World* (1760).[112] The cosmoscope offers something more, a commentary on the universe seen from outside. Traveler's tales—whether they discuss a poisonous tree in Java, flying islanders in the South Sea, or a fairy palace beyond natural space and time—offer an unfamiliar point of view to make readers see their world in a new way. Taken to an extreme, the cosmic journey becomes the cosmoscope, a supernatural perspective outside of Nature that comprehends eternity. In *Queen Mab*, Shelley uses this elevated perspective to advance a philosophical critique that marries a fantastic vision to a determinist view of science. Shelley's poem participates in a long tradition; in the seventeenth century, Kepler used the cosmoscope to challenge the heliocentric model of the universe, and, in the eighteenth century, Blake used the cosmoscope to challenge a polar model of Heaven and Hell. The specific invention of ballooning had minimal direct impact on the cosmoscope, which required a transcendent, imaginary perspective beyond even the reach of the aeronauts. Neither, however, did this incapability

[112] Cf. the alien detachment used by Buffon when he describes humanity in his widely read *HIstoire Naturelle* [*Natural History*] (1749–1804).

discourage the cosmoscope ideal. Natural philosophy, especially the slowly expanding knowledge of the size and complexity of the universe, nurtured cosmic voyage literature, including the cosmoscope, throughout the long eighteenth century.

Sightseeing in Fairyland

In 1813, Percy Bysshe Shelley wrote *Queen Mab: A Philosophical Poem*, a cosmic voyage that uses an imaginary vantage point to present his philosophy of social and natural progress in the real world. Although Shelley hesitated and tried to quash the poem's general circulation, the poem became a powerful manifesto for workers' movements in the nineteenth and twentieth centuries and had a direct influence on Karl Marx and Friedrich Engels. Few works of literature can claim such revolutionary credentials, and the poem begins with a bold Archimedean quotation: "Give me somewhere to stand, and I will move the earth."[113] This epigram asserts the power of philosophical poetry to effect change in the world, a world Romantic poetry could envision as mechanical as well as organic. The mechanical analogy compares a poem to a lever as a tool that multiplies the voice and power of the poet. Archimedes, however, recognized the caveat that any lever requires a fulcrum, a crux on which the lever can pivot. He can move the earth only if he has both the

[113] Unless otherwise noted, all quotations from Shelley are from *Shelley's Poetry and Prose*, edited by Donald H. Reiman and Neil Fraistat. Page numbers are provided for prose citations, while chapter and line numbers are provided for verse. Shelley's own prose notes to *Queen Mab* only appear in abbreviated form in Reiman and Fraistat's *Shelley's Poetry and Prose*, and so these citations instead refer to the full notes given in Reiman and Fraistat's *The Complete Poetry of Percy Bysshe Shelley*.

lever and a place to stand, somewhere that will bear the weight of the world. Shelley's revolutionary lever-poem is no exception, so where can one stand to anchor world-moving force?

Drawing on the tradition of cosmic voyage literature, Shelley imagines a lever placed somewhere firmer, more immovable than the earth, somewhere outside of the earth. I laugh when I picture a tremendous lever working on the earth from space, but this fanciful-yet-technical image is oddly appropriate for Shelley's fanciful-yet-technical *Queen Mab*. In the poem, the titular fairy uses her magic to carry a mortal girl in spiritual form first through the night sky, but the travelers continue upwards even into outer space. A fairyland, located outside of earthly space and earthly history, affords this human girl, named Ianthe, an imaginary vantage point from which she may comprehend the workings of Necessity, the unchanging laws of nature. From this elevated point of view, Shelley attacks such worldly vices as monarchy and priestcraft; from above, Shelley argues, these vices transparently only slow the eternal march of human progress. As works of satire, cosmic voyages refresh their readers' habitual perceptions of the world around them. For Shelley and other authors, the world beneath the critic is not merely full of errors; these errors furthermore become obvious when viewed from above, and the critic corrects worldly misunderstanding with supposedly scientific confidence and vigor.

The otherworldly vision imagined by Shelley is a profoundly scientific vision inasmuch as it draws continuously on the scientific concerns and opinions of

Shelley's day. Critical interest in Shelley's use of science in poetry has been mixed because, for some readers, grounding Shelley's poetry in historical and scientific particulars debases the movements of a spirit working in the world of idealism. I, however, follow Ted Underwood's argument that Shelley's scientific connections are not "something to note briefly and set aside" (299). Not least among my reasons, studies in the history of science now emphasize the imagination's vital role in the scientific process. Scientific study examines many specific cases and then abstracts from them a general case. This movement from experience to the ideal, the mind operating on perceived matter, is an act of imagination, and this transformative act plays a part in both the advancement of science and in the advancement of human society.

Perhaps none more clearly understood this truth than Humphry Davy, who was a poet, a chemist, and one of Shelley's favorite authors. In the essay "Parallels Between Art and Science" (1807), Davy concludes that "Imagination, as well as reason, is necessary to perfection of the philosophical mind" (308). In Davy's *Elements of Chemical Philosophy* (1812), he describes chemistry in both technical and human terms. Davy treats earlier researchers with charity, recognizing the important contributions made by the seventeenth-century German physician Johann Becher even as he corrects Becher's debunked theory of combustion (phlogiston theory). Davy sincerely praises Becher's work as "the conceptions of a most fertile imagination" (16). In Davy's *Elements of Agricultural Philosophy* (1813), he praises the "lively imagination" of eighteenth-century Swedish botanist Carl

Linnaeus, whose work remains the foundation of the scientific naming of animals (55). Linnaeus built his taxonomy on real specimens, but his imagination allowed him to recognize species despite the idiosyncratic differences between individual specimens, and his imagination furthermore allowed him to build up systematic connections between species, grouping several species into a genus. In like fashion, Shelley fuses the diverse resources of both reason and the imagination to create *Queen Mab*, a poetic work intended to propound a self-consciously scientific critique of oppression.

Mab's role as an enabler of vision embodies the best combination of the imaginative and the scientific in the poem. Mab, "the Queen of spells," is unapologetically supernatural (I.63). She is not, however, a deceiving apparition, a mere superstition; for Shelley, the real superstition is the God of traditional religion. Indeed, Mab is a skeptic who dispels superstition. At the beginning of Canto VII, a man reported to have denied the deity is burned at the stake, but Mab herself proclaims that "There is no God!" (VII.13). For Shelley, religious superstition only embodied human ignorance of natural processes, and this ignorance and the gods themselves were ultimately subject to decay and death. In contrast to superstitious gods secondary to nature, Mab is truly <u>super</u>natural: she is over and above nature. Mab exists in her own space, always present outside but scarcely within the terrestrial narratives.

Shelley's unusual, self-identified atheism was a unique contribution to the cosmic voyage form, although such literature, concerned with the cosmos, had long

taken an interest in the assumed creator of that cosmos. In ancient Menippean literature, Greek and Roman gods and immortal heroes had populated the heavens, including the moon. In Cyrano's *L'autre monde*, the narrator-traveler discovers the Garden of Eden on the moon, and Elijah tells him about Adam's translation to earth and Enoch's translation to the heavens. A noted libertine, Cyrano carried his text too close to blasphemy and the passage circulated less widely than other parts of the book. Responding to the balloon launches of 1783, however, Daniel Moore published *An Account of Count D'Artois and his Friend's Passage to the Moon, in a Flying Machine, called, an Air Balloon*. (1785). This extremely rare example of an American contribution to the history of early flight is, unfortunately, dull and derivative of Cyrano, offering a sanitized celebration of Providence from the perspective of the moon. In the 1780s the real-life *Comte d'Artois*, Charles Philippe (later Charles X of France) had a notorious reputation but no identifiable connection to ballooning.[114] The overt radicalism of Shelley's text later caused him and others grief, but, like a balloon, extreme opinions could spread and take on an indeterminable life of their own.

Mab's position above God and nature is literal as well as figurative. When Mab enters the scene of the narrative, the diction continuously evokes the heavens. "Celestial coursers paw the unyielding air" as the "coursers of the air" pull her

[114] The character's religious statements in the text better align with the religious reforms of the Holy Roman Emperor, Joseph II, who was separated by two degrees of marriage from the Count of Artois. The identification of the pious, Protestant character with a wildly dissimilar, real-life Catholic aristocrat may be satirical, but the text is otherwise unironical, leaving the intended effect mysterious.

"ethereal car," her "celestial car" (I.45–113). The poet compares the noise of her approach to the Aeolian harp, "not an earthly sound" but rather "heavenly strains." Mab herself is a celestial figure, compared to clouds, "eastern twilight's shadow," the morning star, and described with mists and halos. Shelley makes it clear that Mab is not of this world. Ianthe's adventure is, in fact, an encounter with an extraterrestrial being. It is, moreover, a close encounter of the fourth kind, to use the idiom of 1970s ufology, an alien abduction. Ianthe's body remains on Earth, however, and her out-of-body experience resembles what is now called *astral projection*.[115] Ianthe's soul rises from her body at Mab's beckoning and accompanies the fairy through the night sky. They fly her magic chariot "above the mountain's loftiest peak," above "The utmost verge of earth," past meteors and atmosphere, and into outer space (I.128–240). The poetry by which Shelley describes interstellar space is worthy of astronomers and science popularizes such as Carl Sagan in its wondering awe of nature.

In 1990, after the *Voyager 1* space probe passed Saturn and prepared to leave the solar system, Sagan requested that the probe take one last photograph of Earth. Upon seeing the now-famous photograph *Pale Blue Dot*, Sagan wrote a now-famous speech to describe the significance of a tiny blue speck in the vast universe:

---

[115] Although the term originates with late-nineteenth-century Theosophists, astral projection had long been part of several world religious traditions. These traditions include the writings of the influential eighteenth-century Christian mystic Emanuel Swedenborg, whose own cosmic voyages I discuss at length near the end of this chapter.

From this distant vantage point, the Earth might not seem of any particular interest. But for us, it's different. Consider again that dot. That's here. That's home. That's us. On it everyone you love, everyone you know, everyone you ever heard of, every human being who ever was, lived out their lives. The aggregate of our joy and suffering, thousands of confident religions, ideologies, and economic doctrines, every hunter and forager, every hero and coward, every creator and destroyer of civilization, every king and peasant, every young couple in love, every mother and father, hopeful child, inventor and explorer, every teacher of morals, every corrupt politician, every "superstar," every "supreme leader," every saint and sinner in the history of our species lived there – on a mote of dust suspended in a sunbeam.

The Earth is a very small stage in a vast cosmic arena. Think of the rivers of blood spilled by all those generals and emperors so that in glory and triumph they could become the momentary masters of a fraction of a dot. Think of the endless cruelties visited by the inhabitants of one corner of this pixel on the scarcely distinguishable inhabitants of some other corner. How frequent their misunderstandings, how eager they are to kill one another, how fervent their hatreds. Our posturings, our imagined self-importance, the delusion that we have some privileged position in the universe, are challenged by this point of pale light . . . There is perhaps no better demonstration of the folly of human conceits than this distant image of our tiny world. To me, it underscores our responsibility to deal more kindly with one another and to

preserve and cherish the pale blue dot, the only home we've ever known. (6–7)

Although written nearly two centuries earlier, *Queen Mab* anticipates Sagan's intuition that a sense of cosmic scale should make observers think critically about justice and tyranny on Earth.

The purpose of *Queen Mab* is to create such a sense of scale, to thrust readers out of their familiar frame of reference to take on a cosmic perspective. As Ianthe and Mab distance themselves from the earth, "The sea no longer was distinguished; earth / Appeared a vast and shadowy sphere" (240–241). Then, at last,

Earth's distant orb appeared
The smallest light that twinkles in the heaven;
Whilst round the chariot's way
Innumerable systems rolled,
And countless spheres diffused
An ever-varying glory.
It was a sight of wonder. (250–256)

Having himself computed the immense distance between solar systems from his readings in astronomy, Shelley knew the obstacles impeding such an interstellar voyage. The poetic magic of Mab's chariot, however, made this distant vista accessible to the human imagination. This expansion of the imagination, Shelley believed, had important and inevitable consequences for society, and Shelley argued that a change of perspective could dispel the political and natural superstitions that

sustained slavery, tyranny, and other miseries by which individuals oppress themselves and each other.

According to Shelley's school friend and later biographer Thomas Hogg, Shelley believed that aerial surveys would create world-changing understanding that would, for example, "annihilate slavery for ever" in Africa (63). Obviously, it is hard not to dismiss this fancy as anything but comically naïve, but this hope was one of the many lofty aspirations disappointed by ballooning, as I discuss in Chapter 4. While space flight remained out of reach at the beginning of the nineteenth century, within the earthly atmosphere "balloonomania" had raged in Europe since the late 1780s. Shelley's description of Mab's chariot rising over the earth, while "Far, far below the chariot's path, / Calm as a slumbering babe, Tremendous Ocean lay," suggests the experiences of early balloonists discovering the sight of the ground from above. In his account of Romantic balloonomania, Richard Holmes describes how "Ballooning produced a new, and wholly unexpected, vision of the earth . . . The early aeronauts suddenly saw the earth as a giant organism, mysteriously patterned and unfolding, like a living creature" (161). Shelley certainly agreed. Even at the time, Hogg noted the wildness of Shelley's optimism, but he was impressed by Shelley's "zealous earnestness for the augmentation of knowledge, and the glowing philanthropy and boundless benevolence that marked" Shelley's speculations on "the march of physical science" (63). Shelley sincerely believed that a change in perspective could effect a profound and lasting change in human nature.

According to this theory, the dangerous, limited flights of the early balloonists could profoundly expand human imagination and consequently expand human virtue. How much more powerful, therefore, must the limitless flights of fancy have seemed? For Shelley, looking through a telescope could shatter a lifetime of superstition: "The plurality of worlds,—the indefinite immensity of the universe is a most awful subject of contemplation. He who rightly feels its mystery and grandeur, is in no danger of seduction from the falshoods of religious systems" (240). Still today as in the eighteenth century, many skeptics and freethinkers contrast the size of the scientifically discovered universe with the relatively anthropocentric concerns of many traditional religions. Cantos VI and VII of *Queen Mab* suggest, in common with many other revolutionary Enlightenment thinkers, that religious systems originated in superstitious explanations of nature, superstitions that had been made obsolete by expanding human knowledge. New tools, such as telescopes, filled gaps in humanity's knowledge of the natural world and literally expanded its horizons, enlarging the size of the known universe. In Shelley's poem, the fairy's magic, like the imagination of the reader or the balloons of the aeronauts, carries Ianthe out of her normal frame of reference and makes the abstracted learning of natural philosophy powerfully and vividly present. Written in the past tense, the poem allows the reader to retrace Ianthe's philosophical journey.

This transcendental, defamiliarizing process naturally raises several questions. If imagination carries Ianthe outside of usual, terrestrial frames of reference, where exactly has she gone? What is the infinite outside in a culture that

is only beginning to understand that the outside exists? At the beginning of the nineteenth century, space is a place beyond human experience, and, in Shelley's poem, this difference is qualitative as well as quantitative. Here again Mab's supernatural qualities serve Shelley's imaginative and philosophical purposes. Folklore offers a precedent for human beings led by fairies into a strange Other space, where the rules of existence fundamentally differ from ordinary experience. When Ianthe enters Mab's palace, she is not entering simply another world "In this interminable wilderness / of worlds" (I.264–265). The nature of being, the ontology, of Mab's palace is qualitatively distinct, not quantitatively distant, from the ontology of Earth. Ianthe is entering Fairyland.[116]

In Shelley's poem, the descriptions of Mab's palace reveal this fundamental difference. The airy language used to describe Mab and her chariot continues: "Mab's etherial palace . . . likest evening's vault, that faery Hall . . . the Hall of Spells," where billowing, "golden clouds" roll beneath "etherial footsteps" (II.21–45). Much of the language is plainly biblical, suggesting the otherworldly opulence of New Jerusalem in Revelations, and Shelley's language of light and color emphasize the impossible beauty of Mab's palace. The examples of this language are too numerous to usefully list here, but the "flashing light," "azure dome," and "crimson mists," suffused with a "thrilling melody," makes this an "unearthly dwelling" indeed (II.22–

[116] The name Ianthe itself has supernatural connotations as one of the Oceanids (a group of ocean nymphs in Classical mythology). Shelley's first wife, Harriet Westbrook, gave birth to their daughter, Ianthe Shelley, in 1813, the year of *Queen Mab*.

54). Yet, Shelley's choice of biblical imagery is simultaneously appropriate and ironic: appropriate because Mab shepherds Ianthe into a realm of eternal truth and ironic because that truth is keenly anti-religious. Explaining to Ianthe, Mab draws a clear distinction between her liberatory fairy palace and the claustrophobic containment of a traditionally religious heavenly palace. Mab intends to reward the good Ianthe, and "to dwell / In a celestial palace . . . immured / Within the prison of itself" is not the fitting "high reward" for her virtue (59–65). Again, Mab's palace is not just quantitatively richer than earthly dwellings; it offers something profoundly different: a different relationship with space-time.

Mab's palace exists outside of space and time. The poem's description of the palace reveals that, although the palace may look like matter, its materials do not behave as matter. Matter does not yield "to every movement of the will," as do the "light and crimson mists" that make up Mab's palace. Ianthe herself is no more material or substantial than the stuff on which she walks and leans; her earthly body still lies "Wrapt in the depth of slumber," while her soul, though "The perfect semblance of its bodily frame" save in its transfiguration, travels with Mab (I.130–156). Here again Shelley uses the conceptual resources of the fantastic—Mab's magical evocation "Soul of Ianthe! / Awake! arise!", Ianthe's astral projection, the imagery of New Jerusalem—to engage the reader's imagination. By casting philosophical speculation in the familiar form of fancy, Shelley makes the impossible possible enough to be useful.

From a point outside of space and time, Shelley's poem is able to explore philosophical speculations that encompass all of space and time, but the philosophy-to-fantasy transmutation is not perfect. Despite the spiritual qualities of the palace, readers cannot really and entirely escape the reference frames of all lived experience. The very words that indicate the abstract and celestial nature of this other space, such as its "pearly battlements," trap it also within our understanding of space, as the pearly gates of Heaven exalt New Jerusalem yet also make literal matter out of the allegorical description of Revelation. Battlements seem a particularly Gothic accoutrement, but surreal fortifications may suggest another world when a wholly alien experience would be impossible to describe. Likewise, time works differently in Mab's palace than on Earth, but it cannot be absolutely done away with in the poem. Mab shows Ianthe all of time, explaining that such elevated vision "is thine high reward:—the past shall rise; / Thou shalt behold the present; I will teach / The secrets of the future (II.65–67). Like a sojourner spirited away in a fairy tale, Ianthe finds that the passage of time in Mab's palace equals only, it seems, a single night on earth.

Despite the poem's frequent descriptions of evening, night, and dawn, the precise times of Ianthe's departure and return are surprisingly difficult to determine. The fairy and the spectral traveler seem to have left at night (I.208), traveled upwards until the dawn was visibly in the east (210–211), and returned at night while "the bright beaming stars" still shone into her bedroom (IX.239–240). While it is possible that more than one night has passed in her spiritual absence

(Henry is not mentioned before she departs but is present when she returns), the dream-like quality of her adventure suggests to me that Ianthe has not been gone long. In Mab's palace, however, despite its timeless qualities, communication still unfolds in chronological sequence, and a conversation without time would be incomprehensible. The narrative theorist Gérard Genette, indeed, defines narrative in part as "the oral or written discourse that undertakes to tell of an event or a series of events" (21). The formal elements of narrative time can be sped up, slowed down, but they cannot be done away with altogether. Passages describing static objects may slow the narrative to an asymptote, but the reader still processes the work across moving time in the act of reading.

Similarly, although Mab and Ianthe look out "o'er the immense of Heaven," where "lay stretched the universe," Shelley evades describing the point at which the universe ends and fairyland begins. This transition hides in the textual lacuna between Cantos I and II of the poem. At the end of Canto I, the magic car disappears momentarily from narrative view while the narrator expresses awe before the cosmos. At the beginning of Canto II, the car has already arrived at its destination. The scene unfolds anew for the reader, but "the magic car no longer moved" (II.40). Whether or not a human can imagine coherently anything outside of space and time is a question of great relevance to philosophers of the eighteenth and nineteenth centuries and to philosophers, cognitive scientists, cosmologists, and mathematicians today. For this reading, however, it is sufficient to identify and then

accept the limits of Shelley's technique. Imagination and poetry take Ianthe, and, by proxy, the reader, among the stars and then beyond the edge of the universe.

While some of the scientific motifs present in *Queen Mab* have been frequently examined in studies of the poem, I am interested instead in the poem's most central but almost entirely unexamined figure: Mab herself. Although Mab often appears on the periphery of *Queen Mab* scholarship, I know no study in which she takes center stage, despite her omnipresence in the poem. Shelley merges the didactic and fanciful fairy stories of Mab with his predecessors in scientific and romance poetry. Examining Mab offers not only fresh insight into Shelley's imaginative fusion of scientific and poetic materials but also illuminates the very nature of Ianthe's revelatory vision in *Queen Mab*.

That vision, though conveyed through the vehicle of fairy magic, is a deeply scientific instrument for observing and understanding the universe. At the beginning of the poem, Ianthe sleeps in an embryonic, before-life state. The unidentified narrator speaks of "Death and his brother Sleep," a classical reference to the twin gods Thantos and Hypnos (I.2). Ianthe is "fair / as breathing marble" (I.16 –17) and has a "sinless soul" (I.11).[117] These praises are juxtaposed, however, with the narrator's anxieties. The narrator asks "Must putrefaction's breath / Leave

[117] Throughout the poem, Ianthe is represented as a soul, a concept familiar to English readers most commonly through Christian discourse but also a concept prominent in Neoplatonism. The word psyche suggests breathing in Greek, and the description here of Ianthe as a breathing statue suggests the combination of matter and soul, and it is Ianthe's soul that, with Mab's help, transcends the limitations of matter in the poem.

nothing of this heavenly sight / But loathsomeness and ruin? (I.17–19). The narrator even wonders, for a moment, whether Ianthe might already have died, seized by "the gloomy Power / Whose reign is in the tainted sepulchers" (I.9–10). From a mortal perspective, before-life, after-life, and everything in between appears a chaos whose only certainty is death. Ianthe's "baby Sleep" will change for her final sleep, and that change could happen suddenly and without warning or apparent reason (I.40). Mab, however, exists outside of Ianthe's mortal slumber, outside the realm of Thantos and Hypnos, and her place outside of the world lets her study the ways of the world and then teach those ways to Ianthe.

The apparent unreasonableness of life and death is a turning point in this poem, and, as Ianthe learns, an invisible order works throughout the confusion. Shelley's choice for Ianthe's tutor, the fairy Mab, is an instructive choice. As Reiman and Fraistat note in their introduction to the poem, "During the eighteenth century Queen Mab was the title character (like Mother Goose) in numerous collections of children's stories" (15). Later in this chapter, I chronicle Mab's surprising journey from a sprite evidently made up by Shakespeare for *Romeo and Juliet* into a household name and part of the tradition of fairy lore. Reiman and Fraistat link Shelley's choice of the character to a letter from Shelley to his publisher Thomas Hookham, in which Shelley suggested that the children of aristocrats might be drawn in by the welcoming title. How seriously we can take this intention is difficult to say, especially since Shelley withheld the volume from public circulation. Although Shelley withheld the volume in response to some belated doubts about its

radical messages and the political environment in which they were received, pirate publishers such as William Clark exhibited less hesitation.[118] When Shelley reworked the poem for publication in 1816, he turned Mab into the sterner-sounding Daemon of the World, which I discuss at length later in this chapter in the context of other tutelary spirits in cosmic voyage literature. In 1813, Shelley chooses the seemingly frivolous character of a famous fairy to carry his serious philosophical message. While I would be surprised if any child could at length mistake Shelley's blank verse volume for the simple prose and rhyme collections that preceded it, the child-like Ianthe nonetheless learns from Mab, so it is worth delving further into Mab's history.

Mab's Cosmoscope

Shelley creates this higher perspective for a purpose. As Mab and Ianthe look out from her palace and back at the universe, they behold how

> Countless and unending orbs
> In mazy motion intermingled,
> Yet still fulfilled immutably
> Eternal nature's law. (73–76)

This fascination with eternal nature's law is a secular reimagining of Providence, of the God who, in William Cowper's proverbial phrase, "moves in a mysterious way." From a mortal perspective, as in the narrator's morbid musings over the sleeping

[118] For a detailed discussion of inexpensive pirate copies of the poem and their life in radical circles, see Fraistat's "Shelley Left and Right: The Rhetorics of the Early Textual Editions."

body of Ianthe at the beginning of the poem, the world's workings appear "mazy," which the *Oxford English Dictionary* defines as "In a state of bewilderment or plexity; giddy, dizzy, confused." Within the chaos, however, there is order as all things move according to natural law. From the eternal perspective of Mab's palace, positioned outside of the universe, the universe appears a literal cosmos, *κόσμος*. The *Oxford English Dictionary* defines *cosmos* as "order, ornament, world or universe (so called by Pythagoras or his disciples 'from its perfect order and arrangement') . . . 1.a. The World or universe as an ordered and harmonious system (OED). Although Mab's magic thwarts the rules of the universe as we know them, the poem reflects Shelley's fascination with the scientific discovery of the mathematical laws that govern the orderly cosmos. Shelley refers to Isaac Newton by name several times throughout his notes on *Queen Mab* and once in the poem itself (V.143).[3] The pervasive, "everlasting and unchanging laws" of Newtonian physics, not a superstitious God, govern Shelley's universe.

In *Queen Mab,* Shelley is especially fond of the orrery imagery, a model of the universe as a mechanical system, with planets and stars moving smoothly and regularly through the universe. References to celestial "globes," "spheres," or "orbs" appear thirty-three times throughout the poem in phrases such as "Earth's distant orb" (I.250), "symphonious with the planetary spheres" (VI.41), "those mighty spheres that gem infinity" (V.149), and "the vast and fiery globes that rolled /

[3] Shelley's notes also refer to a separate "Mr. Newton," John Frank Newton, whose vegetarian family Shelley frequently visited while composing *Queen Mab*.

Around the Fairy's palace-gate" (IX.220–221). The orrery model has moral has well as intellectual ramifications in the Shelleyan universe. In addition to the superstition-destroying power Shelley describes in his previously mentioned note on the vastness of the universe, the laws of celestial mechanics described by Nicolaus Copernicus, Johannes Kepler, and Isaac Newton demonstrated rational order at the universe's largest scales. The rational mind could understand and imagine cosmos, and the writings of economic philosophers such as Jeremy Bentham and Thomas Malthus suggested that, for better or worse, human society too could be understood according to rational principles.

From Mab's palace, from outside the universal machine, these principles appear transparent, like a labyrinth viewed from above. Indeed, an odd descendant of *Queen Mab* is Edwin A. Abbott's mathematical satire *Flatland: A Romance of Many Dimensions* (1884). In one memorable passage from Abbott's novella about a society of geometric shapes, a three-dimensional Sphere lifts a Square out of his home in the two-dimensional country of Flatland. From his new perspective, looking down from the newly revealed Spaceland, the Square's vision comprehends all of Flatland simultaneously. His gaze pierces rooms, cabinets, and even the bodies of his fellow shapes. The Square at first thinks the Sphere is "a Magician" (77), but experiencing "omnividence," all-seeing, for himself expands his mental faculties (80). The experience changes the Square and opens his mind to a higher understanding of Nature. Magic functions similarly in *Queen Mab*. Although materially obtaining

Ianthe and Mab's omnividence seems certainly impossible for human beings, imaginative poetry offers a compelling substitute.

Mab's magic is imagination. Veils in Shelley's poetry are most commonly expressions of ignorance and falsehood, but Mab's magic may "rend / The veil of mortal frailty" (I.180–181). Scientific knowledge is the rending of the veil, imagining the truth and comprehending it as truth. Under Mab's tutelage, Ianthe's "intellectual eye" possesses not only spatial but temporal omnividence (II.98):

> None but a spirit's eye,
> And in no other place
> But that celestial dwelling might behold
> Each action of this earth's inhabitants.
> But matter, space and time
> In those aërial mansions cease to act (87–92)

Omnividence is omniscience in a mechanistic universe. Mab knows the "secrets of the immeasurable past" and so can "find / The future, from the causes which arise / In each event" (I.169–173). Interestingly, Shelley's fairy predates Pierre-Simon Laplace's imagining of a similarly omniscient calculator, Laplace's demon. Laplace explained his character's omniscience more explicitly than Shelley explains Mab's, but both characters can mechanistically determine the future by understanding physics (Laplace 3–4). The key is observing the entire universe simultaneously.

Empowered by an all-seeing perspective, these characters understand the present perfectly and therefore understand the past and the future. The

development of entropy later in the nineteenth century and the Heisenberg uncertainty principle in the twentieth disproved this determinist speculation on logical grounds in addition to the obvious practical impossibility. It is impossible to know perfectly both the position and the velocity of any single particle, let alone of every particle in the universe, but Mab has a secret tool I call the cosmoscope. From an imaginary Archimedean point outside of the universe, Mab can apply her "all-pervading wisdom" to comprehend the universe (II.93). From Mab's magic vantage point, Ianthe perceives the "irresistible law" of nature, which determines "each spring of its machine" (VI.163–164). Only the imagination is magical enough to transcend limited experience and extrapolate an understanding of natural law. The cosmoscope is a special case of cosmic voyage, one that allows mortals to glimpse the universe in its totality and to benefit from that understanding.

The focus of *Queen Mab* often vacillates suddenly between scales, between the celestial and the miniscule, but the transition is not as jarring as one might expect. The fairy Mab operates the cosmoscope, finely controlling focus within the all-seeing perspective, with deliberate purpose for Ianthe, carefully leading her sight from the smallest scales—"the lightest leaf / That quivers to the passing breeze" and even "the meanest worm"—to the largest:

> this interminable wilderness
> Of worlds, at whose immensity
> Even soaring fancy staggers (I.265–272).

The transition is not jarring because Shelley's philosophy imagines nature as essentially the same at all scales of existence, macrocosmic as well as microcosmic. This Neo-Platonic equivalence was a core principle of hermetic philosophy, as in Isaac Newton's translation from the famous *Tabula Smaragdina*: "That w[hi]ch is below is like that w[hi]ch is above & that w[hi]ch is above is like [tha]t w[hi]ch is below" (2).[5] When Shelley calls "the fragile blade of grass . . . an unbounded world" and "the smallest particle / Of the impassive atmosphere" a "mansion," he is unknowingly echoing the visionary rhetoric of another English Romantic poet, the mystic visionary William Blake, who aspired to

> see a World in a Grain of Sand
>
> And a Heaven in a Wild Flower
>
> Hold Infinity in the palm of your hand
>
> And Eternity in an hour (490).

In contradistinction to Shelley, Blake views abstraction, movement from the specific to the general, as the source of falsehood: "Abstraction opposed to the Visions of Imagination" (229). When Shelley uses the few specific figures in his poem—Moses, Ahasuerus, even Ianthe herself—as representative beings, as general types, rather than as specific people, he erases the minute particulars that distinguish those figures as individuals. Although without many particulars, Ianthe's lover, Henry,

[5] The *Tabula Smargadina* [*Emerald Tablet*] is an anonymous, brief collection of cryptic proclamations. A thousand years old before Newton translated a Latin version into English, the *Tabula Smargadina* was a widely influential source of information on the Philosopher's Stone and other hermetic topics.

occupies a strangely ill-defined place in the poem. Kyle Grimes has observed that Shelley places Henry at both the beginning and the end of the poem in the abbreviated revision "The Daemon of the World," which was published in 1816 as part of *Alastor; or, The Spirit of Solitude: And Other Poems*. Grimes aligns Henry with the Arab maid of *Alastor,* and so he represents, in Grimes's reading, "the bounds of conventional reality" (71). Thus this character also becomes an allegorical figure, though one more fully developed from the hints present in *Queen Mab*.

The loss of the minute particulars has wide-ranging consequences. Darby Lewes notes a disturbing mismatch in "Shelley's capacity for simultaneous compassion and casual indifference toward the feelings of others" (149). While I remain skeptical of Lewes's somewhat sensational method that explains Shelley's life (and, by extension, the life of Victor Frankenstein) through his childhood experiences, Lewes makes a stronger case for an egocentric utilitarianism that often ruled or overruled Shelley's professed commitments. Annette Cafarelli reaches a similar conclusion in discussing the disjunction between male and female radical agendas at the beginning of the nineteenth century, claiming that "we should regard Shelley's views, like Godwin's, as well intentioned, but as nevertheless sharing the blindness to gender-based issues that bedeviled the sexual ideology of the men of the era" (609). Two women, Mab and Ianthe, experience Shelley's vision, yet, as Cafarelli's discussion of *Queen Mab*'s future utopia shows, that vision remains ironically insensible to the particular disadvantages experienced by women in free-love communities.

Mab's "intellectual eye" suffers, like a telescope or microscope, from tunnel vision. When focalized from a great distance, Shelley's poetry encompasses the entire universe. It assumes a subject position, outside of the universe, that offers unique advantages to understanding and, in Shelley's belief, to the advancement of human virtue and happiness. At the same time, Shelley can refocus the poem around the smallest particles, which he likens unto worlds themselves, all following the universal laws of Necessity. This perspective brings the macrocosm and microcosm (essentially the same entity from Shelley's point of view) within the bounds of human experience. The literary cosmoscope allows the reader to understand Nature in a way complementary to the understanding generated from a literal telescope or microscope. This valuable perspective applies that smaller understanding on a vast scale, and this cosmic perspective can only be gained through the imagination.

Neither a telescope nor a microscope have any vision on the periphery, however. *Queen Mab's* scathing polemic and idealistic utopianism both brilliantly fuse science and feeling. While the poem brings the great and small into the range of human perception, it thrusts out the experience of medium size, the objects and people of ordinary, individual life. Poetry excels at the middle distance, where distinct individuals and unique experiences resist scientific generalization. In making poetry more like science, *Queen Mab* compromises some of its particular advantages as poetry. The magic of Shelley's fairy queen comes at a price, but a reader can nonetheless learn much from her scientific imagination.

For the largest part of the poem, the reader shares in Ianthe's transcendent vision. This vision begins (Canto II) as Mab shows them the ruins of the past civilizations and the universal cycle of human pride and folly:

> All knowledge of the past revived; the events
>
> . . . . . .
>
> . . . were unfolded
>
> In just perspective to the view;
>
> The Spirit seemed to stand
>
> High on an isolated pinnacle;
>
> The flood of ages combating below (II.244–254)

Cantos III through VII contain the bulk of the poem's social and ideological critique. Through his narrative and through his extensive notes to the poem, Shelley inveighs against superstition and vice in all their many forms: intemperance, war, state tyranny, greed, pride, and more.[119] Political science goes hand in hand with natural science in *Queen Mab*, and Shelley links human depravity to natural desolation. In the past, when humanity is full of vice, deserts and poisonous trees make up Shelley's imagery, but the poem's visions of the future show the Earth as an Edenic paradise. The poem's connection between nature and society is both vividly metaphorical and surprisingly literal.[120] Here again the poem incorporates

---

[119] As Shelley's criticisms have been extensively studied elsewhere and do not directly concern my interest in Mab's scientific-magical vision, I will pass over their details.

[120] For Shelley's extensive use of medical geography and turn-of-the-century climate science, see Alan Bewell's "Percy Bysshe Shelley and Revolutionary Climatology."

contemporary science both as medium and message in illuminating Shelley's model of the world.

This model does not belong to Shelley alone but echoes familiar refrains in necessarianism, an extreme determinist philosophy deriving from a mechanical understanding of a material. In his poem, Shelley writes,

> No atom of this turbulence fulfils
> A vague and unnecessitated tastk,
> Or acts but as it must and ought to act (VI.171–173).

Shelley's notes expand on these verses with a similarly determinist, atomist passage from the *Système de la Nature* [*System of Nature*] of the French materialist Baron d'Holbach:

> Il n'ya a pas une seule molecule de poussière ou d'eau qui soit placée au hazard, qui náit sa cause suffisante pour occupier le lieu oú elle se trouve, et qui nágisse rigoureusement de la maniére dont elle doit agir.
>
> [There is not a single molecule of dust or water that is placed by chance, that does not have its sufficient cause to occupy the place where it is, and that does not rigorously act after the manner in which it ought to act.] (Shelley's *Complete Poetry* 257)[6]

[6] The English above is my translation. Shelley's complete note consists entirely of two paragraphs of d'Holbach's untranslated French and is not included in most editions of *Queen Mab*.

In addition to d'Holbach, Shelley's most direct determinist influence was William Godwin himself, whom Shelley met in 1812 while composing *Queen Mab*. Godwin defended his progressive, optimistic reading of human development from the pessimism of political economist Thomas Robert Malthus, whose work was familiar to Shelley from his reading in Humphry Davy's *Agricultural Chemistry* (Ruston 95–96). *Queen Mab* throws its whole weight behind Godwin, as well as the similar optimism of French philosopher and mathematician Nicolas de Condorcet, to whom Shelley refers alongside Godwin in his Necesss notes on *Queen Mab*. This is a traditional reading of what has often been dismissed as a juvenile work by a talented but naïve poet.[121]

Shelley's notes on the poem refer numerous times to Godwin's writings in *The Enquirer* and *Political Justice*, and the poem itself refers to necessity several times, including Mab's passionate apostrophe: "Spirit of Nature! all-sufficing power, / Necessity! Thou mother of the world!" (VI.197–198). To this invocation Shelley appends a long note on "the doctrine of Necessity," its materialist underpinnings, and profound social and moral changes that must develop from its acceptance. For all its determinism, Shelley's early philosophy is by no means defeatist. In his note, Shelley writes, "The conviction . . . that a tyger is constrained, by the inevitable

[121] In "The Aesthetic of Utopia in Shelley's Queen Mab," James Silver finds "the projected utopianism of Queen Mab heavily qualified and problematized to an extent unlikely to excite optimism" (104). Likewise, in Romance and Revolution: Shelley and the Politics of a Genre, David Duff takes great care to distinguish between Godwin and Shelley's respective philosophical views even as early as Queen Mab (93–110).

condition of his existence, to devour men, does not induce us to avoid them less sedulously" (261). Rather, Necessity affirms the importance of understanding the laws that, by necessity, move the tiger so that humans may better kill or, better still, evade and so render harmless the predator. In *Political Justice*, Godwin writes that "wisdom is power" and human knowledge of "truth is conducing to the perfection of our virtue (231–232). Through the magic, poetic vision of *Queen Mab*, Shelley illustrates this hope and makes the whole of Necessity, "the storm of change, that ceaselessly / Rolls round the eternal universe," accessible to the reader's imagination.

Shelley's interest in astronomy and social mechanism were one part of his broader faith in the advancement of human understanding and its accompanying improvement in human virtue. The skeptical inquiry of the new sciences, natural or political, was limited only by material resources and the human imagination. Although Shelley's flights of fancy, as in *Queen Mab*, were limitless, his ability to imagine human progress was, as his own frequent citations show, strongly influenced by his environment. The strength of the scientific method stems from its ability to generalize cases. To learn how one particular object behaves in one particular experiment is an extremely limited, mostly unhelpful kind of knowledge (and thus it contributes very little power to the perfection of human virtue). Human science, however, must start somewhere.

Shelley's magical Mab is not bound by mortal limitations (or research funding!). She does not have Ianthe study one king; she observes all of them, and so

the poem presents generalized conclusions about the vicious nature of kingship. The problem of inductive reasoning is, of course, the arena of David Hume, whose naturalistic "Of Miracles" (§ X) follows essays on the nature of induction (§§ IV, V, and VI) and Necessity (§§ VII and VIII), and Shelley cited Hume in his notes to *Queen Mab*.[7] Such inductive reasoning, however, although useful, can overstep the bounds of truth and lose something valuable in the movement from the specific to the general.

Mythic Science

Although Mab occasionally appears in new literature even today, the character went largely dormant until the middle of the eighteenth century, when a new interest in Mab suddenly broke out in London. The most notable early use of Queen Mab occurs in Shakespeare's *Romeo and Juliet* (published 1597), when Mercutio speaks frivolously to annoy Romeo, irritating the love-sick youth with his lengthy description of Mab, "the fairies' midwife . . . no bigger than an agate stone" (I.iv.55–56). Seemingly invented by Shakespeare, the diminutive and mischievous Queen Mab contrasts with the human-sized fairy queen Titania of *A Midsummer Night's Dream* (published 1600). Both plays were first performed approximately 1595, with *Romeo and Juliet* possibly being first written and/or first slightly earlier than *A Midsummer Night's Dream*, but the dating evidence is inconclusive. Despite her literary rival, however, Mab survived largely unchanged in Ben Jonson's fairy

[7] From the volume and page number Shelley provides in his note, I can deduce that he was using the 1800 Edinburgh edition of Hume's *Essays and Treatises on Several Subjects*.

masque *The Entertainment at Althorp* (1603), Michael Drayton's fairy romance poem *Nimphidia the Court of Fayrie* (1627), and Joshua Poole's poetical reference work *The English Parnassus, or a Helpe to English Poesie*" (1657). Invented by Shakespeare, the character then owed her continued life to the playwright's long popularity on the English stage.

In the autumn of 1750, dueling productions of *Romeo and Juliet* became the talk of London's theater scene. Theater historians have made note of this "battle of the Romeos" that raged across the stages of the Covent Garden and Drury Lane theaters (Holland 441). For twelve consecutive nights, both theaters performed *Romeo and Juliet*, inviting readers to compare their respective merits (Brewer 69). Scholars have mined the incident for diverse insights into the inner workings of the eighteenth-century patent theaters, but one previously overlooked consequence of the war seems to have been an odd surge of interest in Mab.[122] In December of that year, David Garrick produced Henry Woodward's pantomime "Queen Mab" ("Drury Lane Theatre"). For the first time in a century, Mab returned significantly to the public consciousness outside of *Romeo and Juliet*.

[122] For additional analysis of the battle of the Romeos, see Charles Haywood's "William Boyce's 'Solemn Dirge' in Garrick's *Romeo and Juliet* Production of 1750" (1960), Kalman Burnim's *David Garrick, Director* (1961), George Stone Jr.'s "*Romeo and Juliet*: The Source of Its Modern Stage Career" (1964), George Branam's " The Genesis of David Garrick's *Romeo and Juliet*" (1984), Leslie Ritchie's "Pox on Both Your Houses: The Battle of the Romeos" (2015), Elaine McGirr's "'What's in a Name?' *Romeo and Juliet* and the Cibber Brand" (2017), and Chelsea Phillip's "Bodies in Play: Maternity, Repertory, and the Rival *Romeo and Juliets*, 1748–51" (2019).

The following year, Michael Drayton's *Nimphidia* [*Regarding Nymphs*] found new life adapted for the stage as *The History of Queen Mab* (1751). Reminiscent both of Arthurian romance and Pope's *The Rape of the Lock*, the adaptation continued a fad for Mab-related literature. According to Drayton, Mab was the fairy king Oberon's "merry Queene, by night" (162). In 1752 Mab proved herself as slippery as Shakespeare's fairy Puck, "that merry wanderer of the night" (*A Midsummer Night's Dream* II.i.43). The Mab brand achieved sufficient marketing power to take on a life of its own. The *contes de fées* of Marie-Catherine d'Aulnoy originally had no connection to Mab. D'Aulnoy's story collection had been published in French as early as 1697 and were published in English every decade from the 1710s to 1800. At the midpoint of the century, however, a strange change occurred, presumably to capitalize on the success of the recent Mab spectacles. Although sharing an interest in fairies as literary and dramatic machinery, these dramatic, spectacular, poetical, and prose works pursued significantly different interests, which found an uneasy synthesis in the character of Queen Mab.

In 1752, what had previously been published as *A Collection of Novels and Tales of the Fairies* was retitled *The Court of Queen Mab: Containing a Select Collection of Only the Best, Most Instructive, and Entertaining Tales of the Fairies*. This new volume includes the verse "Queen Mab's Song," which draws on the keyhole-sized, prankster Mab. In d'Aulnoy's actual stories, however, Mab makes no appearance. The cover page is her fairyland, over but separate from the world of the d'Aulnoy stories that suddenly bore her name. Indeed, the diminutive, trickster Mab

clashes thematically with the deeply serious, human-sized fairies actually portrayed in d'Aulnoy's stories. With titles such as "The Little Good Mouse" and with rhyming morals following the end of each story, the many editions of d'Aulnoy's *Queen Mab* circulating throughout England by the end of the eighteenth century embodied among the worst examples of the "didactic poetry" that Shelley called his "abhorrence" in the preface to *Prometheus Unbound* (Shelley 209). Shelley wrote the preface to *Prometheus Unbound* in 1819, seven turbulent years after composing *Queen Mab*, and it is debatable how abhorrently didactic his own earlier work is. While I cannot say with certainty that Shelley read the d'Aulnoy *Queen Mab* or any other particular collection of fairy tales, he was certainly aware of such literature. His comment to Hookham, his choice of the name "Queen Mab," and references to fairies throughout his prose writings provide evidence of this awareness.

This readerly background makes Mab a meaningful character to instruct Ianthe in Shelley's poem. Skeptical poetry that uses gods, fairies, and immortal wanderers seems at first contradictory, but the supernatural offers Shelley potent resources to attack his ideological enemies and to advance his positive agenda of human improvement. Shelley introduces supernatural elements to counter superstition, not to affirm their existence. In *The Reception of Myth in English Romanticism*, Anthony Harding offers a more detailed account of Shelley's "psychological, human-centered theory of myth" (165). Harding argues that

> mythology, when revisioned as borrowing its authority from the human imagination itself [as Shelley does], can subvert the complacent acceptance of

> orthodox religious belief. Mythology becomes an important part of the armory of the skeptical poet . . . In the hands of a skeptical writer, mythology can do this work precisely because it lacks higher authority. (163)

By placing Christian beliefs alongside classical religion and European folk traditions, Shelley levels these beliefs, reclassifying Christianity as merely one myth among many.

In Chapter 1 I outlined four overarching categories of early flight narrative, and I drew upon the technical vocabulary of folklore studies, which distinguishes among genres of folklore, including myth, legend, legend, tale, and so on. According to the influential folklorist Alan Dundes, myth "consists of a sacred narrative explaining how the world and man came to be in their present form" (56). In Romantic studies, however, "myth" has meant many different things to many different people, a scholarly knot discussed at length in Anthony John Harding's introduction to *The Reception of Myth in English Romanticism*. Shelley's myth-making denies Christian myth any exceptional authority, which is one prong in Queen Mab's assault on religious belief. This profaning is important because, as the Mab tells Ianthe, "The name of God / Has fenced about all crime with holiness (VII.26–27). Revealing the mythic nature of God historicizes religion, stripping away that holiness and leaving sacred violence open to criticism.

Although the fairy Mab is normally overlooked in this discussion, this anti-orthodoxy mythic historicizing is a familiar move in Romantic scholarship. Canto VI of *Queen Mab* mostly consists of Shelley's mythic account of how human error and

ignorance originally produced the god delusion. In Canto VII, Mab observes that "human pride / Is skilful to invent most serious names / To hide its ignorance" (24–26). This explanation appears throughout Shelley's writings, including "Hymn to Intellectual Beauty"—"the name of God and ghosts and heaven" (27)—and "The Necessity of Atheism." Readers of Romantic poetry will immediately recall a similar account in Blake's *The Marriage of Heaven and Hell*, wherein "men forgot that All deities reside in the human breast" (38). While Shelley did not know Blake's work, Reiman and Fraistat note that this idea, locating the origins of religion in natural wonder, was "already a radical commonplace" by Shelley's time, and Reiman and Fraistat identify two of Shelley's philosophical influences, d'Holbach and Volney,[123] as Shelley's predecessors in this technique. Like Blake, Shelley was fascinated by the human capacity to create myth even while resisting its potential for abuse and deception. Through imagination, human beings can look beyond their immediate circumstances and envision real change in themselves and in society.

The new philosophy finds many forms throughout *Queen Mab*. Often Shelley's wide reading and conversation in natural philosophy made its way into his poetry. Shelley's whole system of thought rooted itself in an atomist, Epicurean naturalism, which he married to an epistemological idealism: Shelley was fascinated by the imaginative possibilities of matter. Shelley's more abstract philosophical concerns

[123] Constantin François de Chassebœuf, Count of Volney, a philosopher of the early French Revolution, whose *Les Ruines, ou méditations sur les révolutions des empires* (1791). *Les Ruines* appears an influential reading for the Creature in Mary Shelley's *Frankenstein* (1818).

have attracted more scholarly interest than have his engagements with specific facts of natural philosophy. Michael A. Vicario provides a difficult but thorough interpretation of Shelley's philosophical underpinnings in *Shelley's Intellectual System and Its Epicurean Background*, while Terence A. Hoagwood provides a less thorough but more accessible account in *Skepticism & Ideology: Shelley's Political prose and Its Philosophical Context from Bacon to Marx*. In particular, Hoagwood describes how *Queen Mab* espouses an enthusiasm for "simple mechanistic determinism," the fundamentally Newtonian nature of the universe (144). Although Shelley gradually qualified his enthusiasm for this determinism, his early poem *Queen Mab* imagines human life intimately connected to the wider material universe:

> There's not one atom of yon earth
> But once was living man;
> Nor the minutest drop of rain,
> That hangeth in its thinist cloud,
> But flowed in human veins. (29)

There are three explicit references to "atoms" throughout the verses of the poem. For Shelley, atomism is both a compelling scientific theory and an ontological truth with important consequences for human existence.

Both the form and the content of Shelley's "Philosophical Poem" take a deliberate interest in science. Another of the poem's epigrams is from a key work of Epicurean philosophy popular among proponents of the new science: the *De Rerum*

Natura of the Roman poet-philosopher Lucretius. Lucretius argues that poetry is the honey that sweetens the sometimes-bitter medicine of philosophical learning, and Shelley and Lucretius both seek "*religionum animum nodis exsolvere*" [to loose the mind from the knot of religion] (*De Rerum Natura*, IV.1–7). The main text of *Queen Mab* is accompanied by Shelley's own prodigious notes explaining his references to chemistry, geology, astronomy, and other sciences. At times, Shelley's notes read far more like a scientific essay than as a commentary on poetry. When the magic chariot carries Ianthe beyond the earth's atmosphere, Shelley prosaically cites an encyclopedia article:

> The nearest of the fixed stars is inconceivably distant from the earth, and they are probably proportionably distant from each other. By a calculation of the velocity of light, Sirius is supposed to be at least 54,224,000,000,000 miles from the earth. (See Nicholson's Encyclopedia, art. Light.) [Shelley's note] (240)

Annotated poetry was nothing new, but Shelley's annotations, unlike, for example, the literary, critical, and satiric annotations of Alexander Pope, enhance the poem as a work of natural philosophy rather than purely classical art. While the currently accepted distance from Earth to Sirius is closer to 51 trillion miles than Shelley's 54, the calculation nonetheless demonstrates that the universe revealed by science is vast, even vaster than imagination alone could conceive, without the observations of science to expand its perceptions.

Science shapes *Queen Mab* both as a more general influence on Shelley's worldview and as a rich source of emblems. In his analysis of emblem culture, John Manning defines the traditional emblem as having "three parts – a 'lemma' or motto, a picture, and a following explanatory text" (18). *Queen Mab*'s memorable imagery serves as picture, motto, and explanation, introducing an image and developing its allegorical nature at length; throughout Cantos 4, 5 and 6 of the poem, Shelley deploys the image of a poisonous tree to denounce the doctrine of original sin, which governments and religions use to justify tyranny. In 1784, the newspaper *St. James Chronicle; Or, British Evening Post* published an account of miasma-producing tree, whose diseased air was deadly to all life within a fifteen-mile radius. According to the account, the tree was used by the emperor as a means of corporal punishment and by Islamic authorities as an instrument of divine wrath. These monarchical and religious connotations must have made the story especially striking when Shelley read this and other sources reproduced in full as scientific notes to the two-volume poem *The Botanic Garden* (1791) by the naturalist and poet Erasmus Darwin. Shelley describes the tree, he dwells on how its "venomed exhalations spread / Ruin, and death, and woe" (IV.83–84), and his descriptions are both allegorical and botanical.

Shelley takes the upas tree and more besides from his two most direct influences in writing *Queen Mab*: Darwin's *The Botanic Garden* and the poet Robert

Southey's *Thalaba the Destroyer* (1799).[124] They are all heavily annotated, metrical works interested in natural and social history. Shelley had spent hours talking with Southey in 1811, though their relationship grew more antagonistic in later years, and Mary Shelley identifies *Thalaba* as a direct influence in her 1839 foreword to her husband's poem. The title-page of *Queen Mab; A Philosophical Poem: With Notes* echoes Darwin's title page advertisement "With Philosophical Notes."[125] Shelley's scientific interests, however, blur distinctions among science, literature, and political philosophy.

The legendary poisonous tree, also called the upas tree of Java or *Antiaris toxicaria*, is a powerful single example of how Shelley combines fabulous tales, natural history, and didactic poetry to advance his radical politics. Southey's footnote attributes the "fiction of the Upas" to Darwin, who popularized the tale in *The Botanic Garden* by reprinting a number of sources from the 1780s (Southey X.203n). The articles quoted by Darwin recognize the improbability of their claims but take pains to distinguish their "the study of Natural History and the

---

[124] As a biographical curiosity, both Robert Southey and the poet Samuel Taylor Coleridge participated in Humphry Davy's experiments with nitrous oxide, i.e., laughing gas, in 1799, and Coleridge regarded Davy highly as a chemist and as a poetical mind. These connections underscore again the intimacy of science and imaginative literature in the eighteenth century.

[125] The connections between the three poems are too numerous to treat in detail here, but more detailed discussion can be found in D. G. King-Hele's "Shelley and Science" and John Warner Taylor's "The Sources of Shelley's Queen Mab." Published in 1906, Taylor's article takes a dim view of Shelley's "incoherent and inflammatory" poem, the product of a "youthful, overheated brain" (324). As criticism, Taylor's article dismisses the poem too readily, but the article is nonetheless an outstandingly detailed catalog of Shelley's literary and political influences.

advancement of Sciences" from "ingenious fiction" ("Description of the Poison-Tree").[126] In his exhaustive catalogue of animal imagery in Shelley's work, Lloyd Jeffrey observed that Shelley "was generally indifferent to zoological accuracy" and was "first of all a poet" (iv). I suggest that the fictionality of the upas tree may have been more controversial than Southey's disbelieving footnote suggests, but, in any case, the upas tree represents a scientific question that contained an emblematic truth about the enduring effects of evil. Throughout *Queen Mab*, the upas tree models the miasmic vice and superstition of humanity as well the natural cycle that fertilizes new growth from decay.

Cosmic Daemons

Fantastical science is typical of the cosmic voyage form and reflects early modern thinking about flight as both a perfectly common natural phenomenon as well as an extraordinary, superhuman phenomenon. In Chapter 2, I discussed the *Mathematicall Magick* (1648) of John Wilkins, a book that remained the recognized English authority on the art of flying until late in the eighteenth century. Wilkins describes "four severall ways whereby this flying in the air, hath been or may be attempted": with spirits, with birds, with wings, and with a flying chariot (199–200). Wilkins disregards the first of these to seek flight instead "upon *natural* and

[126] Darwin does not quote a later article, "The History of Dr. Coral and His Amiable Daughter Theodora, an Interesting Narrative, Founded on Facts" (1786). Presumably, Darwin, if he knew of "Dr. Coral." found in the other accounts at least the possibility of truth, while this latter narrative only used the tree's poison as a plot device in a moralizing family tragedy. Both the more self-consciously scientific articles and "Dr. Coral" were widely anthologized in the 1780s and 1790s, albeit respectively for botanical and moral education.

artificial grounds" (i.e., by natural means available to human invention) (201). Wilkins appreciates, however, the conceptual possibilities of supernatural flight, and his treatise cites Biblical as well as fictional examples that blur distinctions between fact and fancy for literary effect, including the 1609 *Somnium* [*Dream*] of Johannes Kepler.

The seventeenth-century German astronomer Johannes Kepler is most well-known for his three laws of planetary motion, but he was a prolific, wide-ranging author. Like Shelley two centuries later, Kepler used the cosmic voyage form to explore in his imagination scientific reasoning that could not be tested observationally. Kepler's semi-autobiographical fantasy *Somnium* envisions a young man, Duracotus, who is instructed in astronomy first by Kepler's own teacher, Danish astronomer Tycho Brahe, and second by "*maximè omnium mitis atque innoxius*" [the most peaceful and harmless of all] "*sapientissimi spiritus*" [the wisest spirits] (4). According to Duracotus's mother, a witch, this daemon has carried her through the universe and readily answers any questions she has about the cosmos. Through his narrative, Kepler imagines life from the perspective of beings living on the moon: how they would travel from the earth to the moon, how long the journey would take, what celestial motions would such beings see in their sky, and other astronomical questions. A fierce supporter of the heliocentric model of the solar system, which he improved, Kepler demonstrates in *Somnium* that the heliocentric model is a logically consistent, rational explanation for the data of astronomical observations. Bolstered by his extraordinary notes appended to the 1634

posthumous edition, the *Somnium* uses the imagined perspective of the cosmoscope to compelling effect.

Kepler's choice to call his tutelary spirit a *daemon* connects his story to the past and future of cosmic voyages. Kepler lived to regret the name, as Kepler believed that his *Somnium* contributed to the rumors that culminated in his mother's long but ultimately exculpating trial for witchcraft. Between one endnote decrying the injustices done to Copernicus by the ignorant and another discussing volcanoes in literature, Kepler wryly notes that "Nisi fallor, sic censebitis potuisse & domum meam carere vexatione sexennali, & me peregrinatione annali proxima, nisi somniata præcepta Fiolxhildis hujus violassem." [Unless I'm mistaken, you will suppose I and my house could have avoided six years' trouble and my journey of last year, if I had not violated the precepts of this Fiolxhilde"] (32).[127] The name *daemon*, however, suggesting a kind of minor Greek deity guiding and guarding a young person, appropriately describes the supernatural entities at work in Kepler's *Somnium* and Shelley's *Queen Mab*.

Indeed, when Shelley revised *Queen Mab* for publication in 1816, he turned his fairy into a daemon, and the transformation eases some tension in the text. Shelley may have decided that a fairy queen, especially one with a history of whimsy, was not a suitable vehicle for the poem's serious philosophy, too ironic for

[127] In *Somninum*, the witch Fiolxhilde takes the place of Kepler's own mother and forbids him to reveal her secrets. The trial of Kepler's real mother for witchcraft suggests that the fictional witch had her revenge on him for writing her secrets into *Somnium*.

the purpose. The new version, titled *The Daemon of the World*, makes one reference to fairyland but otherwise omits the words *fairy* and *Mab* entirely in favor of the Daemon. The tutelary character herself remains largely unchanged after shedding her background as the queen of the fairies. Indeed, Shelley seems to have been uncomfortable from the start with making a monarch the mouthpiece of his antimonarchical philosophy; Shelley overwhelmingly prefers to call the character "Mab," "the Fairy," or the Fairy Mab." Rarely, she is "the Fairy Queen" and "the Queen of spells," but she is never "Queen Mab" except on the title page. Admittedly, this otherworldly queen has little in common with the arbitrary, male tyrants whose depredations and downfalls she exhibits to Ianthe. She possesses neither any subjects nor any laws save the unalterable laws of nature.

Nonetheless, the poem elsewhere goes to discernible lengths to avoid the appearance of philosophical impropriety. Shelley's Lucretian epigram on the power of poetry to liberate the mind makes a significant omission from the original text. Shelley fills a gap in his quotation with a line of six asterisks, but, rather than indicating a larger break in the quotation, the stars only replace a single line in which Lucretius declares that his purpose is "*Insignemque meo capiti petere inde coronam*" [to seek for my head a distinguished crown] (*De Rerum Natura* IV.2). In Latin, *corona* denotes both a crown of authority and a wreath of accomplishment (such as a chaplet of laurel, olive, or oak leaves). A crown of collected flowers suggests the vernal beauty of the poet's surroundings, but the highest Roman military decoration, the *corona graminea* [grass crown], sometimes contained

flowers as it was collected from the vegetation available at the site of a great victory. A poet's crown is nonetheless a crown, a symbol with connotations of monarchy and violence, two vicious forces within Shelley's cosmology. Mab transforms easily from fairy queen to guiding spirit because her role in Shelley's tale is to reveal the cosmos, not to rule it.

The air is full of spirits, and, while the devil may be the father of lies, literature suggests an array of angels and demons who are only too eager to reveal and explain the world below to mortal ears. English essayist Joseph Addison deploys the cosmoscope in his oriental tale "The Vision of Mirzah" (*The Spectator*, No. 159). In Addison's story, a man outside of Baghdad meets a "genius," (a guardian spirit and the Roman equivalent of the Greek *daemon*), who is characterized by his "superior Nature" and his "Compassion and Affability" (543). The genius leads Mirzah to "the highest Pinnacle" of a nearby rock, from which Mirzah can look out and perceive a vast, allegorical landscape: "the Vale of Misery" sits within "the great Tide of Eternity," which contain many smaller representations of human misfortunes and human vices. Mirzah at first mistakes this grim vision for the whole of human experience, but the compassionate spirit strengthens Mirzah's sight beyond mortal ability. Mirzah then perceives the vastness of eternity, and the genius teaches Mirzah how brief the tribulations of life seem when shown in correct proportion to future paradise. The gloom that clouds worldly experience dissipates when viewed through the supernatural cosmoscope.

Shelley's Ianthe, Kepler's Duracotus, and Addison's Mirzah each benefit from supernatural guides, and these guides operate the narrative machinery in a way that distinguishes these examples from other cosmic voyage stories. A fairy, a demon, a genius—if the cosmoscope has an operator, that operator is generally a supernatural being who introduces a mortal character to a supernatural vantage point. Largely silent, the mortal observes and listens, recording for the audience the visions of the cosmoscope and the wisdom of the operator. I say *operator* because the supernatural being actively focalizes the visions, guiding the mortal's gaze and interpreting what is seen. In almost all cases, the operator becomes a simple channel for the author and voices the author's critique without any challenge within the narrative. One can imagine a story in which two voices offer competing interpretations of the cosmoscope's visions (perhaps a miniature angel and matching devil, one each sitting on mortal shoulders). Such an arrangement would, however, sacrifice the principle rhetorical force of the cosmoscope: the power to present an opinion and perspective as something certain, something transcendent, something obvious and beyond argument when all possible evidence is brought into view. Two divine interpreters only degrade themselves by arguing, which suggests that neither is self-evidently trustworthy.

In rare cases, however, discrediting the interpreter might be part of the author's purpose. In *The Marriage of Heaven and Hell* (1790), William Blake champions individual genius over external authorities. While the first-person narrator is not explicitly named, I am comfortable identifying Blake's poetical

persona with Blake himself. Swedenborg wrote of his visions in his own voices, and Blake here imitates Swedenborg. Moreover, the poem's narrator is a printer, who prints "in the infernal method, by corrosives, which in Hell are salutary and medicinal, melting apparent surfaces away, and displaying the infinite which was hid" (39). This mystical description, of course, corresponds to Blake's professional work chemically engraving on copper plates.[128] In one of the poem's several "Memorable Fancy" episodes, the poem has the mortal narrator seize control of the cosmoscope from his intended guide.[129] An angel leads Blake underground to a "void boundless as a nether sky" to threaten Blake with the terrors of hell: "the infinite Abyss, fiery as the smoke of a burning city; beneath us at an immense distance was the sun, black but shining" (41). When the monstrous sea serpent Leviathan appears in the deep, however, the angel flees to the ordinary world and abandons Blake to the hell-fury of the beast. Hell vanishes with the angel, however, and Blake finds himself instead "on a pleasant bank beside a river by moon light" (42). When Blake returns to the ordinary world, he explains to the surprised angel that the hell he had seen "was owing to your metaphysics" (42). The angel carried hell within him and projected that illusion of conventional religion onto reality. By contrast, Blake locates prophetic vision in his internal poetic genius.

---

[128] Appropriate to his mysticism, Blake attributed his innovative method of *illuminated printing* to the ghost of his deceased brother Robert Blake.
[129] The "Memorable Fancy" episodes are themselves imitations of Swedenborg's *memorabilia* (commonly translated in Swedenborgian context as "Memorable Relations"), spiritual narratives included in *Apocalypsis Revelata* [*Apocalypse Revealed*] (1766).

Blake's individual genius enables him not only to recognize a false perspective but also to cleanse the perceptions of others by operating the cosmoscope himself. When Blake looks into subterranean deep, he intends to jump from his tree-root perch, but the angel, seated on an upside-down mushroom, urges against a rash action. This keeps the angel and the man within the universe, however, and therefore limits their vision. The true cosmoscope demands a fuller perspective. In Blake's poem, the angel's vision, spiritual but ultimately limited and conventional, represents the spiritual vision of Swedish natural philosopher and mystic Emanuel Swedenborg. In Chapter 3, I discussed Swedenborg's mechanically-inclined scientific journal *Daedalus Hyperboreas* [*Daedalus of the Far North*] as well as Swedenborg's proposals for a heavier-than-air flying machine. A wide-ranging mind, Swedenborg wrote on subjects as varied as metallurgy, neurology, and eschatology, and Swedenborg's work on this last subject, *De Caelo et Eius Mirabilibus et de inferno, ex Auditis et Visis* [*Of Heaven and Its Wonders and of Hell, from Things Heard and Seen*] (1758), attracted Blake's critical response in *The Marriage of Heaven and Hell*.

Blake and Swedenborg both recognized the importance of a cosmic frame of reference. I cannot say whether Blake knew much about Johannes Kepler, but the avid astronomer Swedenborg was certainly familiar with at least some of Kepler's work, perhaps even *Somnium*.[17] In his hermetic interpretation of the Bible, *Arcana*

[17] Unlike Kepler's story, however, Swedenborg's spiritual encounters are not intended as fiction.

Coelestiae [*The Secrets of Heaven*] (1749-1756), Swedenborg attributes some of his mystic knowledge to conversations with spirits on distant planets, as when he mentally traveled "*ad aliam Tellurem quae in universo extra mundum nostrum solarem*" [to another Earth that was in the universe beyond our solar world] (*Arcana Coelestiae* 655). In *De Caelo*, Swedenborg reports that he understands the occult meaning of the celestial imagery of the Bible because he has spoken with angels "*homo cum homine*" [man to man] and has been allowed "*Videre quae in caelis, tum quae in infernis*" [to see what is in Heaven, then what is in Hell] (4–5). Blake rejects Swedenborg's polarized view of the moral world; viewed from the right perspective, Blake argues, Hell contains Heaven, and Heaven contains Hell. Blake criticizes Swedenborg for speaking only with angels and not with devils; Swedenborg could only discover part of the cosmos, while Blake's system encompasses everything.

Like Shelley, Blake finds his cosmoscope in the depths of outer space, not within or beneath the terrestrial sphere but in distant regions increasingly revealed by astronomy. Blake's narrative is as forceful as his opinions in seizing the high ground:

> he [the angel] laughd at my proposal: but I by force suddenly caught him in my arms, & flew westerly thro' the night, till we were elevated above the earths shadow: then I flung myself with him directly into the body of the sun, here I clothed myself in white, & taking in my hand Swedenborgs volumes sunk from the glorious clime, and passed all the planets till we came to

saturn, here I staid to rest & then leap'd into the void, between saturn & the fixed stars.

Here said I! is your lot, in this space, if space it may be calld (42)

While the astronomer William Herschel had identified Uranus in 1781, the discovery remained controversial in part because in 1783 Herschel named the planet *Georgium Sidus* [George's Star] in honor of King George III, who had become Herschel's patron in 1782. The name proved unpopular to say the least.

Blake's omission of *Georgium Sidus* may simply represent disinterest, or it may be a pointed rejection of the frequent politicization of natural discoveries at the end of the eighteenth century. Although the German astronomer Johann Elert Bode suggested the eventual name, Uranus, in 1782, the contest for the planet's name continued into the mid-nineteenth-century. Competing names, many politically charged, flourished amid European unrest and rivalries. Writing for the Academy of St. Petersburg in 1787, the Finnish-Swedish astronomer Anders Johan Lexell observed that other proposed names included "*le Neptune de George III*" [the Neptune of George III] and "*le Neptune de la grande Bretagne*" [the Neptune of Great Britain] in honor of British naval power (82). In 1788, Blake's fellow Dissenter and radical David Williams sneered that "All Europe revolted at the absurdity; and not an astronomer out of England (and the astronomer royal only in England) will call it *Georgium Sidus*" (59). In 1799, the well-connected *philosophe* Bathélemy Faujas de Saint-Fond wrote that "all astronomers, actuated by a feeling of general gratitude, have, with one unanimous voice, unbaptised it [*Georgium Sidus*], and given it the

name of *the planet of Herschel*" (67). De Saint-Fond notes, however, that his countryman the astronomer and mathematician Pierre-Simon Laplace "calls this planet Uranus," though De Saint-Fond says he is "ignorant of the reason of this change" (67) and cannot consult with Laplace due to the French Revolutionary Wars. In any case, the adventurous Blake flies beyond the known worlds and drags a fearful angel with him.

Blake's literal cosmology mirrors his radical moral universe. By traveling beyond the solar system, Blake also travels beyond the realm of familiar political and religious tenets. The space travelers Blake and the angel soon discover that the most distant celestial regions in fact contain the same entrance to Hell that the angel showed Blake on Earth: a stable containing a church containing a mill containing the underworld. That which is below is not merely like that which is above; they are one and the same, and the universe is a non-orientable surface like a Möbius strip or a Klein bottle. If one travels far enough, good leads into evil, and evil leads into good, Blake's model of contraries and progression. When Blake writes that "Now hear a plain fact: Swedenborg has not written one new truth: Now hear another: he has written all the old falshoods" (42), he criticizes Swedenborg's sharp opposition of Heaven and Hell. Blake argues instead that "Opposition is true Friendship" (41). In *The Marriage of Heaven and Hell,* the cosmoscope reveals that Heaven and Hell cleave together and are one.

The balloonomania phenomenon was a radical development in the history of human flight, but it released neither Heaven nor Hell and failed to revolutionize a

long-lived European aerial tradition of spectacular hope and measure skepticism. Early human flight represents a literary and historical tradition vastly broader than scholars have recognized. Familiar kinds of flight narratives, such as the Oriental tale, can be understood as subsets within a larger field of historical flight narratives. Two descriptive attributes—dianoia and realism—establish formal sets of human flight narratives that occur throughout the long eighteenth-century. While some scholars have noted a skeptical backlash to balloonomania, this skepticism echoed a long-standing, antiaerial tradition in English scientific culture. A century before balloonomania, flying machines symbolized bad science, science that was at best unproductive and wasteful and at worst a threat to continued civilization. Antiaerial sentiment, evidenced in popular culture and scientific writing, demonstrates that philosophical and practical objections cast flight research as an illegitimate enterprise.

Great man theories of the history of flight have dismissed the long eighteenth century for its absence of a central hero (such as Leonardo da Vinci or the Wright brothers), and even recent scholarship on balloonomania overlooks the lively productions of this seemingly unproductive century. Human flight did not stagnate in the long absence of obvious progress towards the construction of a flying machine, nor did the invention of aerostatic ballooning in 1783 reform the existing structures of human flight. The diverse visual culture of flight exposes not only flight's interconnectedness across media but also the resilience of flight's established forms of representation. Although scholars correctly argue that

balloonomania proved short-lived, the disappointments of ballooning were accommodated by ballooning's integration into human flight's existing traditions. The traditional expansiveness of flight narratives was not circumscribed by the practical limitations of human flight. In cosmic voyage literature, the persistence of the cosmoscope belies the decline of human flight in the wake of balloonomania.

Bibliography

"100 Most Influential Photographs of All Time." *Time Magazine,* 100photos.time.com/photos/nasa-earthrise-apollo-8

A. B. C. D. E. *Novembris Monstrum.* 1641. *Early English Books Online.*

Abbott, Edwin A. *Flatland: A Romance of Many Dimensions.* London, 1884. *Google Books.*

Addison, Joseph. *The Spectator.* No. 159, 01 Sep. 1711. *The Spectator Project,* scc.rutgers.edu/spectator/project.html.

Addison, Joseph. *The Spectator.* No. 262, 21 Dec. 1711. *The Spectator Project.*

Allchin, Douglas. "Monsters & Marvels." *The American Biology Teacher,* vol. 69, no. 9, 2007, pp. 565–568. *JSTOR.*

Aravamudan, Srinivas. *Enlightenment Orientalism: Resisting the Rise of the Novel*. U of Chicago P, 2012.

Athenaeus of Naucratis. *The Dipnosophists, or, Banquet of the Learned Athenaeus. E*dited by C. D. Yonge, vol. 2, London, 1854. *University of Wisconsin Digital Collections.*

Auerbach, Erich. *Mimesis: The Representation of Reality in Western Literature - New and Expanded Edition.* Edited by Edward Said, Princeton UP, 2013.

Bacon, Francis. *Sylua Syluarum: or, A Naturall Historie. In Ten Centuries*. [With *New Atlantis*]. 2nd ed., London, 1627. *Early English Books Online,* STC / 822:05.

Bacon, John M. *The Dominion of the Air: The Story of Aërial Navigation.* Cassell, 1902.

Baldwin, Thomas. *Airopaidia*. Chester, 1786.

Bannet, Eve Tavor. *The Domestic Revolution: Enlightenment Feminisms and the Novel*. Johns Hopkins UP, 2000.

Bate, Jonathan. “Living with the Weather.” *Studies in Romanticism,* vol. 35, no. 3, 1996, pp. 431–447. *JSTOR*.

Bauer, Melchior. "Die Flugzeughandschrift des Melchior Bauer." 1764. *Horst Decker GbR*, Traktorveteranen.de/flugzeug/M-Bauer11.html.

Behn, Aphra. *The Rover and Other Plays.* Edited by Jane Spencer, Oxford UP, 1995.

Bertelsen, Lance. "Popular Entertainment and Instruction, Literary and Dramatic: Chapbooks, Advice Books, Almanacs, Ballads, Farces, Pantomimes, Prints, and Shows." *The Cambridge History of English Literature, 1660–1780,* edited by John Richetti, Cambridge UP, 2005, pp. 61–86.

Besnier's Flying Machine. *Le Journal des sçavans,* 12 Dec. 1678. *Bibliothèque nationale de France*, Paris, gallica.bnf.fr/ark:/12148/bpt6k56529j.

Bewell, Alan. “Percy Bysshe Shelley and Revolutionary Climatology.” *Shelley’s Poetry and Prose,* edited by Donald H. Reiman and Neil Fraistat, Norton, 2002, pp. 627–636.

Bible, The. Edited by Robert Carroll and Stephen Prickett, Authorized King James Version, Oxford UP, New York, 1997.

Blake, William. *The Complete Poetry and Prose of William Blake.* Edited by David V. Erdman, Random, 1988.

Blanchard, Jean-Pierre and François-Nicolas Martinet. "Mécanique du Vaisseau-Volant." *Bibliothèque nationale de France*, Paris, département Estampes et photographie, RESERVE QB-370 (6)-FT 4, gallica.bnf.fr/ark:/12148/btv1b69422238.

Borgman, Albert S. *Thomas Shadwell: His Life and Comedies*. Benjamin Blom, 1969.

Boswell, James. *The Life of Johnson, LL. D.* 1791. Edited by John Croker, 2 vols, New York, 1833.

Bourdieu, Pierre. “The Specificity of the Scientific Field and the Social Conditions of the Progress of Reason.” *The Science Studies Reader*, edited by Mario Biagioli, Routledge, 1999, pp. 31–50.

Boyle, Robert. *Suspicions about Some Hidden Qualities of the Air.* 1674*. Early English Books Online.*

Branam, George. “ The Genesis of David Garrick’s *Romeo and Juliet.*” *Shakespeare Quarterly*, vol. 35, no. 2, 1984, pp. 170–179.

Brandstetter, Thomas. "*Elefanten im Mond: Der prekäre Status des wissenschaftlichen Instruments*." *Berichte zur Wissenschaftsgeschichte,* vol. 27, 2004, 109–118. *Project MUSE*.

Brant, Clare. *Balloon Madness: Flights of Imagination in Britain, 1783–1786*. Woodbridge: Boydell, 2017. Print.

Brewer, David. *The Afterlife of Character, 1726–1825*. U of Pennsylvania P, 2011. *Google Books*.

Brouwer, W. "The Image of the Physicist in Modern Drama (Part 2)." *American Journal of Physics*, vol. 62, no. 3, 1994, pp. 234–240.

Bryden, D. J., and D. L. Simms. "Spectacles Improved to Perfection and Approved of by the Royal Society." *Annals of Science,* vol. 50, 1993, 1–32. *JSTOR*.

Burattini's Flying Dragon. *Mélanges de physique et de mathématiques*. *Bibliothèque nationale de France*, Paris, Département des manuscrits, Latin 11195, archivesetmanuscrits.bnf.fr/ark:/12148/cc72814p.

Burnim, Kalman. *David Garrick, Director.* Originally published 1961, Southern Illinois UP, 1973.

Butler, Samuel. *The Elephant in the Moon Miscellaneous Thoughts*. London, 1670. *Google Books*.

Butterworth, Philip. *Theatre of Fire: Special Effects in Early English and Scottish Theatre.* Society for Theatre Research, 1998.

Byron, F., V. Green, and F. Jukes. "A Representation Of Mr. Lunardi's Balloon, As Exhibited In The Pantheon." London, 1784. *National Air and Space Museum*, Washington, DC, A20140890000.

Cafarelli, Annette Wheeler. "The Transgressive Double Standard: Shelleyan Utopianism and Feminist Social History." *Shelley's Poetry and Prose,* edited by Donald H. Reiman and Neil Fraistat, Norton, 2002. 607–616.

Cambridge, Richard. *The Scribleriad: An Heroic Poem.* London, 1751. *Eighteenth-Century Collections Online.*

Campbell, Mary. *Wonder and Science: Imagining Worlds in Early Modern Europe.* Cornell UP, 2004.

Carroll, Siobhan. *An Empire of Air and Water: Uncolonizable Space in the British Imagination, 1750–1850.* U of Pennsylvania P, 2015. *Project MUSE.*

Cavallo, Tiberius. *The History and Practice of Aerostation.* London, 1785.

Cavendish, Margaret. *Observations Upon Experimental Philosophy.* Edited by Eileen O'Neil, Cambridge UP, 2001.

Cavendish, Margaret. *The Blazing World and Other Writings*. Edited by Kate Lilley, Penguin, 2004.

Ceramic Plates. C. 1800. *National Air and Space Museum*, Washington, DC, A20020124000, A20020123000.

Chamber, Ephraim. *A Supplement to Mr. Chambers's Cyclopædia: or, Universal Dictionary of Arts and Sciences.* 2 vols., 1753.

Chambers Encyclopaedia: A Library of Universal Knowledge for the People. New York, 1890. Hathi Trust Digital Library.

Chaplin, Seymour. "A Legendary Bon Mot?: Franklin's 'What is The Good of a Newborn Baby?" *Proceedings of the American Philosophical Society*, vol. 129, no. 3, 1985, pp. 278–290.

Chapman, Allan. *England's Leonardo: Robert Hooke and the Seventeenth-Century Scientific Revolution.* Institute of Physics Publishing, 2005.

Charmaz, Kathy. "Grounded Theory as an Emergent Method." *Handbook of Emergent Methods*, edited by S. N. Hesse-Biber and P. Leavy, Guilford, 2008, pp. 155–172.

Chico, Tita. "Sir Nicholas's Legacy: Sex, Wealth, and the Theater of Experimental Philosophy." *Comparative Drama,* vol. 42, no. 1, 2008, pp. 29–49. *Project MUSE*.

Choudhury, Mita. "Gazing at His Seraglio: Late Eighteenth-Century Women Playwrights as Orientalists." *Theatre Journal,* vol 47, no. 4,1995, pp. 481–502.

Coppola, Al. "Retraining the Virtuoso's Gaze: Behn's *Emperor of the Moon*, The Royal Society, and the Spectacles of Science and Politics." *Eighteenth-Century Studies,* vol. 41, no. 3, 2008, pp. 481–506. *JSTOR*.

Council in the Moon, The. Cambridge, 1765. Eighteenth-Century Collections Online.

Cowper, William. *The Task.* London, 1785. *Eighteenth-Century Collections Online.*

Crook, Nora. "*Peter Wilkins*: A Romantic Cult Book." *Reviewing Romanticism,* edited by Philip W. Martin and Robin Jarvis, St. Martin's, 1992, pp. 86–98.

Crouch, Tom. "Using Science to Solve an Object Mystery." Smithsonian National Air and Space Museum*,* 06 Jun. 2018. *airandspace.si.edu*.

Cutts, John P. "Music and the Supernatural in 'The Tempest': A Study in Interpretation." *Music & Letters*, vol. 39, no. 4, 1958, pp. 347–358. *JSTOR*.

Cyrano de Bergerac. *Histoire comique: contenant les états et empires de la Lune*. Paris, 1657. *Bibliothèque nationale de France*, Paris, département Fonds du service reproduction, Y2-25400, ark:/12148/bpt6k101934s.

Cyrano de Bergerac. *Σεληναρχια [Selenarhia], or, The Government of the World in the Moon: A Comical History*. Translated by Tho. St. Serf. London, 1659. *Early English Books Online*.

d'Aulnoy, Marie-Catherine. *Queen Mab: Containing a Select Collection of Only the Best, Most Instructive, and Entertaining Tales of the Fairies.* 5th ed., London, 1799. *Eighteenth Century Collections Online*.

Daniel, Gabriel. *Voiage du Monde de Descartes*. Paris, 1690. *Bibliothèque nationale de France,* Paris, département Philosophie, histoire, sciences de l'homme, R-13616, ark:/12148/bpt6k9616538k.

Darwin, Erasmus. *The Botanic Garden,* edited by Donald H. Reiman, 2 vols, Garland, 1978.

Davis, Joseph, and Ambrose Warren. "Aeronautics." London, 1818. *Library of Congress*, Washington, DC, LOT 13404, no. 5 [P&P].

Davy, Humphry. "Parallels Between Art and Science." *The Collected Works of Sir Humphry Davy. E*dited by John Davy, vol. 8, London, 1840, pp. 306–308. *Google Books*.

Davy, Humphry. *Elements of Agricultural Chemistry.* New York, 1815. *Google Books*.

Davy, Humphry. *Elements of Chemical Philosophy. V*ol. 1, Bradford, 1812. *Google Books*.

Defoe, Daniel. *The Consolidator: or, Memoirs of Sundry Transactions from the World in the Moon.* London, 1705. *Eighteenth-Century Collections Online.*

Dégh, Linda, and Andrew Vázsonyi. "Legend and Belief." *Folklore Genres*, edited by Dan Ben-Amos, U of Texas P, 1976.

Derham, William. *Physico-Theology.* London, 1714. *Early English Books Online*.

Dibdin, Charles. *The Magic of Orosmanes; or, Harlequin Slave and Sultan: A Pantomime, Drawn from the Arabian Legends*. London, 1785. *Eighteenth-Century Collections Online*, CW3309777548.

Dibdin, Charles. *The Songs, &c. in the New Pantomime called The Lancashire Witches: or, The Distresses of Harlequin*. London, 1783. *Eighteenth-Century Collections Online*, CW3316873486.

Dibdin, Charles. *The Vicissitudes of Harlequin. A Pantomime*. London, 1790. *Eighteenth-Century Collections Online*, CW3315841908.

Dimock, Wai Chee. "A Theory of Resonance." *PMLA,* vol. 112, no. 5, 1997, pp. 1060–1074.

Dircks, Henry. *Perpetuum Mobile: Or, A History of the Search for Self-Motive Power from the 13th to the 19th Century.* London, 1870.

Dollfus, Charles, and Henri Bouché. Histoire d l'aéronautique. L'Illustration, 1942.

Domingo, Darryl. "'The Natural Propensity of Imitation': or, Pantomimic Poetics and the Rhetoric of Augustan Wit." *Journal for Early Modern Cultural Studies,* vol. 9, no. 2, 2009, pp. 51–95.

"Dr. Musgrave's Machine: A Vision." *Oxford Magazine*, vol. 3, Sep. 1769, pp. 108–112. *Hathi Trust Digital Library*, hdl.handle.net/2027/hvd.32044089242341?urlappend=%3Bseq=122.

Drayton, Michael. *The History of Queen Mab; or, the Court of Fairy.* London, 1751. *Eighteenth Century Collections Online*.

"Drury Lane Theatre." *Folger Shakespeare Library*, folger.edu.

Duff, David. *Romance and Revolution: Shelley and the Politics of a Genre*. Cambridge UP, 1994.

Duff, David. *Romanticism and the Uses of Genre*. Oxford UP, 2009.

Duhem, Jules. *Histoire des idées aéronautiques avant Montgolfier. Sorlot, 1943.*

Duhem, Jules. *Musée aéronautique avant Montgolfier*. Sorlot, 1943.

Dundes, Alan. *The Meaning of Folklore: The Analytical Essays of Alan Dundes*. Edited by Simon J. Bronner, Utah State UP, 2007.

English passarola diagram. C. 1784. *National Air and Space Museum*, Washington, DC., A20140548000.

European Magazine and London Review [London], vol. 73, 26 Dec. 1718, pg. 58. *Eighteenth-Century Collections Online,* CB3331309372.

"Experiments Made with the Gum of the Upas-Tree." *St. James's Chronicle.* No. 3563. *17th-18th Century Burney Collections Newspapers*.

Fauja de,Saint-Fond, Bathélemy. *Travels in England, Scotland, and the Hebrides; Undertaken for the Purpose of Examining the State of the Arts, the Sciences, Natural History, and Manners, in Great Britain*. London, 1799. *Eighteenth Century Collections Online*.

"Felix Baumgartner's Supersonic Freefall from 128k' – Mission Highlights." *YouTube*, uploaded by Red Bull, 14 Oct. 2012, youtube.com/watch?v=FHtvDA0W34I.

Felski, Rita. "Context Stinks!" *New Literary History,* vol. 42, 2011, pp. 573–591. *Libra*.

"Figure de la Barque inventée en 1709 par Laurent de Gusman Chapelain du Roi de Portugal pour s'élever et se diriger dans les Airs." C. 1784. *Bibliothèque nationale de France*, Paris, département Estampes et photographie, FOL-IB-4 (2), gallica.bnf.fr/ark:/12148/btv1b85095492.

"Figure exacte et proportions, du globe aërostatique, qui, le premier, a enlevé des hommes dans les airs." 1786. *Library of Congress*, Washington, DC, LOT 13403, no. 12 [P&P].

Fleming, John V. *The Dark Side of the Enlightenment: Wizards, Alchemists, and Spiritual Seekers in the Age of Reason.* Norton, 2013.

Fortier, Rénald. "The Balloon Era." *Candian Aviation Museum*, 2004, ingeniumcanada.org/aviation/doc/research/casm/e_Ballons.pdf

Foucault, Michel. *The Birth of the Clinic*. Translated by A. M. Sheridan, Routledge, 2012. *Google Books*. Web.

Fox, Christopher. *The Cambridge Companion to Jonathan Swift.* Cambridge UP, 2003.

Fraistat, Neil. "Shelley Left and Right: The Rhetorics of the Early Textual Editions." *Shelley's Poetry and Prose*, edited by Donald H. Reiman and Neil Fraistat, Norton, 2002, pp. 645–653.

Framed Ceramic Tiles. 1800s. *National Air and Space Museum*, Washington, DC.

Frye, Northrop. *Anatomy of Criticism: Four Essays.* Princeton UP, 1957.

General Advertiser [London], no. 2547, 24 Dec. 1784. *17th-18th Century Burney Collection Newspapers*, Z2001693207.

General Advertiser [London], no. 2634, 07 Apr. 1785. *17th-18th Century Burney Collection Newspapers*, Z2001693409.

Genette, Gérard. *Narrative Discourse: An Essay in Method*. Translated by Jane E. Lewin, Cornell UP, 1980.

Gilde, Joseph M. "Shadwell and the Royal Society: Satire in *The Virtuoso*." SEL *Studies in English Literature, 1500–1900,* vol. 10, no. 3, 1970, pp. 469–490. *JSTOR*.

Glanvill, Joseph. *The Vanity of Dogmatizing.* 1661. *Early English Books Online*.

Glaser, Barney, and Anselm Strauss. *The Discovery of Grounded Theory: Strategies for Qualitative Research.* Aldine, 1967.

Gloucester Journal [Gloucester], no. 3253, 16 Aug. 1784. *17th-18th Century Burney Collection Newspapers*, Z2000494044.

Godwin, Francis. *The Man in the Moone, or, A Discourse of a Voyage Thither by F. G., B. of H.* London, 1657.

Godwin, Francis. *The Man in the Moone: or, A Discovrse of a Voyage Thither by Domingo Gonsales the Speedy Messenger*. 2nd ed., London, 1638.

Godwin, William. *An Enquiry Concerning Political Justice, and Its Influence on General Virtue and Happiness*. Vol. 1, Dublin, 1793. *Eighteenth Century Collections Online*.

Goldstein, Laurence. *The Flying Machine and Modern Literature.* Indian UP, 1986.

Golinski, Jan. *British Weather and the Climate of Enlightenment.* U of Chicago P, 2007.

Gouk, Penelope. "The Role of Acoustics and Music Theory in the Scientific Work of Robert Hooke." *Annals of Science,* vol. 37, 1980, pp. 573–605. *JSTOR*.

Gove, Philip. *The Imaginary Voyage in Prose Fiction: A History of Its Criticism and a Guide for Its Study.* Holland, 1961.

"Gulliver, or, The Island of Laputa." London, 1818. *Victoria and Albert Museum*, London,
S.857-2009.

Green, Katherine. “Balloon and Seraglio: Burkean Anti-Imperialism in Elizabeth Inchbald’s *The Mogul Tale*.” *Restoration and Eighteenth-Century Theatre Research*, vol. 25, no. 1, 2010, pp. 5–24. Ebscohost.

Guardian. No. 112, 20 Jul. 1713. *17th-18th Century Burney Collection Newspapers.*

Ha, Inhye. “Cosmic Blindness, Comic Blindness: The Lunar Imagination and Women’s Place in Aphra Behn’s *Emperor of the Moon*.” *English Language and Literature, vol.* 62, no. 3, 2016, pp. 423–40. *JSTOR*.

Hampton, Timothy. *Writing from History: The Rhetoric of Exemplarity in Renaissance Literature*. Cornell UP, 1990.

Harding, Anthony John. *The Reception of Myth in English Romanticism*. U of Missouri P, 1995.

Hart, Clive. *The Prehistory of Flight,* U of California P. 1985.

Hayden, Judy, editor. *Travel Narratives, the New Science, and Literary Discourse, 1569–1750.* Ashgate, 2012.

Haywood, Charles. “William Boyce’s ‘Solemn Dirge’ in Garrick’s *Romeo and Juliet* Production of 1750.” *Shakespeare Quarterly*, vol. 11, no. 2, 1960, pp. 173–187.

Hegele, Arden. "Romantic Balloons: Toward a Formalist Technology of Poetics." *Partial Answers: Journal of Literature and the History of Ideas. V*ol. 15, no. 2, 2017, pp. 201–216.

Hill, Cecily. "Narrative Didacticism in Amelia Opie's *Adeline Mowbray*." *Studies in English Literature, 1500–1900,* vol. 55, no. 4, 2015, pp. 731–751.

“The History of Dr. Coral, and His Amiable Daughter Theodora, an Interesting Narrative Founded on Facts.” *General Evening Post,* Vols. 8141 and 8142, 1786. *17th-18th Century Burney Collection Newspapers*.

Hoagwood, Terence Allan. *Skepticism & Ideology: Shelley’s Political Prose and Its Philosophical Context from Bacon to Marx*. U of Iowa P, 1988.

Hogg, Thomas Jefferson. *The Life of Percy Bysshe Shelley*. Vol. 1, London, 1858. *Google Books*.

Holland, Peter. “David Garrick.” *The Cambridge Guide to Theatre*, edited by Martin Banham, Cambridge UP, 1995, pp. 411–412. *Google Books*.

Holmes, Richard. *Falling Upwards: How We Took to the Air.* Pantheon, 2013.

Holmes, Richard. *The Age of Wonder: How the Romantic Generation Discovered the Beauty and Terror of Science.* Vintage, 2010.

Honko, Lauri. "The Problem of Defining Myth." *Sacred Narrative: Readings in the Theory of Myth*, edited by Alan Dundes, U of California P, 1984, pp. 41–52.

Hooke, Robert. *Micrographia.* London, 1665. *Google Books*.

Hooke, Robert. *The Diary of Robert Hooke, MA, MD, FRS, 1672–1680*. Edited by Henry W. Robinson and Walter Adams, Taylor and Francis, 1968.

Howarth, William Driver. *Molière: A Playwright and His Audience.* Cambridge UP, 1982.

Hume, David. "Of the Standard of Taste." 1757. *David Hume: Selected Essays.* Edited by Stephen Copley and Andrew Edgar, Oxford UP, 1998, pp. 133–153.

Hunt, Leigh. *The Correspondence of Leigh Hunt*. Edited by Thornton Leigh Hunt, London, 1862. Hathi Trust Digital Library.

Hunter, J. Paul. *Before Novels: The Cultural Contexts of Eighteenth-Century English Fiction*. Norton, 1990.

Inchbald, Elizabeth. *The Mogul Tale; or, The Descent of the Balloon. A Farce.* Dublin, 1788. *Eighteenth-Century Collections Online*.

Jeffrey, Lloyd N. *Shelley's Knowledge and Use of Natural History.* U Salzburg, 1976.

Johnson, Samuel. *The Prince of Abissinia. A Tale*. 2nd ed., London, 1759. *Eighteenth-Century Collections Online*.

Kareem, Sarah Tindal. *Eighteenth-Century Fiction and the Reinvention of Wonder.* Oxford UP, 2014.

Keen, Paul. "The 'Balloonomania': Science and Spectacle in 1780s England." *Eighteenth-Century Studies,* vol. 39, no. 4, 2006, 507–535. *Project MUSE*.

Kepler, Johannes. *Somnium, seu opus posthumum de astronomia lunari.* Edited by Ludwig Kepler, Frankfurt, 1634. *ProQuest*.

King-Hele, D. G. "Shelley and Science." *Notes and Records of the Royal Society of London,* vol. 46, no. 2, 1992, pp. 253–265. *JSTOR*.

Kolb, Gwin. "Johnson's 'Dissertation on Flying' and John Wilkins' 'Mathematical Magick.'" *Philological Quarterly*, vol. 50, 1971.

Kuhn, Thomas. *The Structure of Scientific Revolutions.* 4th ed., U of Chicago P, 2012.

L'Estrange, Roger. *Fables of Aesop and Other Eminent Mythologists with Morals and Reflexions.* London, 1692. *Early English Books Online*.

Lana Terzi, Francesco. *Prodromo, ouero saggio di alcune inuentioni nuoue presmesso all'arte maestra.* Brescia, Rizzardi, 1670. *Google Books*.

Landa, Louis. "Johnson's Feathered Man: 'A Dissertation on the Art of Flying' Considered." *Essays in Eighteenth-Century English Literature*. Princeton UP, 1980, pp. 160–177.

Laplace, Pierre-Simon. *Essai Philosophique sur les Probabilités.* Paris, 1814. *Google Books*.

Latour, Bruno, and Steve Woolgar. *Laboratory Life: The Construction of Scientific Facts*. Sage, 1979.

Latour, Bruno. "Drawing Things Together." *Representation in Scientific Practice,* edited by Michael Lynch and Steve Woolgar, MIT P, 1990, pp. 19–68.

Latour, Bruno. *Down to Earth: Politics in the New Climatic Regime.* Translated by Cathy Porter, Polity, 2018.

Latour, Bruno. *The Pasteurization of France*. Translated by A. Sheridan and J. Law, Harvard UP, 1988.

Leonardo da Vinci. *Codex Atlanticus*. C.1480. *Veneranda Biblioteca Abrosiana and Mondadori Portfolio*, codex-atlanticus.it/#/Detail?detail=860

Lewes, Darby. "Prophet and Loss: Women and Shelley's Utopian Experiment." *A Brighter Morn: The Shelley Circle's Utopian Project,* edited by Darby Lewes, Lexington, 2003, pp. 143–164.

Lewis, Jayne Elizabeth. *Air's Appearance: Literary Atmosphere in British Fiction, 1660–1794.* U of Chicago P, 2012.

Lexell, Anders Johan. "Recherches sur la nouvelle Planète dècouverte par M. Herschel & nommée par lui *Georgium sidus*." *Nova Acta Academiae Scientiarum Imperialis Petropolitanae, v*ol. 1, St. Petersburg, 1783, pp. 69–82. *Google Books*.

Löfkvist, Hans-Eric. "Några kommentarer till Emanuel Swedenborgs flygplansprojekt." *Daedalus* [Stockholm], 1988. *Sveriges Tekniska Museum, digitalamodeller.se/arsbocker/daedalus-1988/.*

Lucian of Samosata. *Lucian's Works*. Translated by Ferrand Spence, 5 vols., London, 1684. *Early English Books Online*, Wing / L3424.

Lucretius. *De Rerum Natura*. *Perseus Digital Library*, perseus.tufts.edu/hopper/.

Lynn, Michael R. *The Sublime Invention: Ballooning in Europe, 1783–1820.* Pickering, 2010.

Lyons, John. *Exemplum: The Rhetoric of Example in Early Modern France and Italy*. Princeton UP, 1989.

Lyotard, Jean-François. "Defining the postmodern." *The Cultural Studies Reader*, edited by Simon During, Routledge, 1993, pp. 170–176.

Maddux, Harry. "*The Virtuoso* and Puritanism in 1676." *E-Research@Tennessee State University*, 2007.

Makdisi, Saree, and Felicity Nussbaum, editors. *The Arabian Nights in Historical Context: Between East and West*. Oxford UP, 2008.

Manley, Delarivier. The New Atalantis. 2nd ed., London, 1709. Eighteenth-Century Collections Online.

Mannheimer, Katherine. "Celestial Bodies: Readerly Rapture as Theatrical Spectacle in Aphra Behn's "Emperor of the Moon." *Restoration: Studies in English Literary Culture, 1660–1700,* vol. 35, no. 1, 2011, pp. 39–60. *JSTOR*.

Manning, John. *The Emblem.* Reaktion, 2002.

Marion, Fulgence, and P. Sellier. *Les ballons et les voyages aériens*. Paris, 1867. *Hathi Trust Digital Library*, hdl.handle.net/2027/uc1.$b276902?urlappend=%3Bseq=157.

McColley, Grant. "The Three Editions of Filippo Morghen's *Raccolta.*" *The Art Bulletin*, vol. 19, no. 1, 1937, pp. 112–118.

McGirr, Elaine. "'What's in a Name?' *Romeo and Juliet* and the Cibber Brand." *Shakespeare*, vol. 14, no. 14, 2017, pp. 399–412.

McKeon, Michael. *The Origins of the English Novel, 1600–1740.* Johns Hopkins UP, 1987.

Merchant, Peter. "Robert Paltock and the Refashioning of *Inkle and Yarico*." *Eighteenth-Century Fiction,* vol. 9, no. 1, 1996, pp. 37–51.

Merchant, Peter. "Snatched from the Sea: The Survival of *Peter Wilkins*." *Children's Literature in Education,* vol. 21, no. 2, 1990, pp. 67–82.

Milton, John. *Paradise Regained.* Edited by Thomas H. Luxon, *The John Milton Reading Room*, 2017.

Mohler, N. M. and Marjorie Nicolson. "The Scientific Background of Swift's *Voyage to Laputa.*" *Annals of Science,* vol. 2, no. 3, 1937, pp. 299–334. *Taylor & Francis Online*.

Monthly Review, or, New Literary Journal [London], vol. 4, 24 Dec. 1750, pg. 157. *Hathi Digital Library*, hdl.handle.net/2027/hvd.hxihba?urlappend=%3Bseq=171.

Moore, Daniel. *An Account of Count d'Artois and His Friend's Passage to the Moon, in a Flying Machine, called, an Air Balloon*. Litchfield, CT, 1785. *Eighteenth-Century Collections Online*, CB130866385.

Morning Chronicle and London Advertiser [London], no. 4894, 20 Jan. 1785. *17th-18th Century Burney Collection Newspapers*, Z2000872457.

Morning Herald and Daily Advertiser [London], no. 943, 05 Nov. 1783. *17th-18th Century Burney Collection Newspapers*, Z2000915105.

Morning Herald and Daily Advertiser [London], no. 944, 06 Nov. 1783. *17th-18th Century Burney Collection Newspapers*, Z2000915130.

Morning Herald and Daily Advertiser [London], no. 962, 27 Nov. 1783. *17th-18th Century Burney Collection Newspapers*, Z2000915363.

Morning Herald and Daily Advertiser [London], no. 965, 01 Dec. 1783. *17th-18th Century Burney Collection Newspapers,* Z2000915413*.*

Morning Herald and Daily Advertiser [London], no. 988, 27 Dec. 1783. *17th-18th Century Burney Collection Newspapers,* Z2000915649 and Z2000915661.

Morning Post [London], no. 6466, 10 Jan. 1794. *17th-18th Century Burney Collection Newspapers*, Z2000924063.

Morning Post and Daily Advertiser [London], no. 3355, 10 Nov. 1783. *17th-18th Century Burney Collection Newspapers*, *Z2000948448*

Morning Post and Daily Advertiser [London], no. 3431, 6 Feb. 1784. *17th-18th Century Burney Collection Newspapers, Z2000948760.*

Morning Post and Daily Advertiser [London], no. 3633, 05 Oct. 1784. *17th-18th Century Burney Collection Newspapers*, Z2000950323.

Morning Post and Daily Advertiser [London], no. 3783, 25 Mar. 1785. *7th-18th Century Burney Collection Newspapers*, Z2000952353.

Morning Post and Daily Advertiser [London], no. 4099, 6. Apr. 1786. *17th-18th Century Burney Collection Newspapers*, Z2000954890.

Morning Post and Fashionable World [London], no. 7698, 14 Nov. 1796. 17th-18th Century Burney Collection Newspapers, Z2000973298.

Morris, Ralph. *A Narrative of the Life and Astonishing Adventures of John Daniel*. London, 1751. *Eighteenth-Century Collections Online.*

Nelson, Holly Faith, and Sharon Alker. 'As Far as a Woman's Reasoning May Go': Aphra Behn, *Oroonoko*, and the New Science. *Travel Narratives, the New Science, and Literary Discourse, 1569–1750,* edited by Judy Hayden, Ashgate, 2012.

"The New Mail Carriers, or Montgolfier and Katterfelto taking an airing in balloons." *Rambler's Magazine; or, The Annals of Gallantry, Glee, Pleasure, and the Bon Ton* [London], vol. 1, 1784, pg. 472. *The British Museum*, London, 1868,0808.5072.

Newton, Isaac. "Keynes MS. 28." *The Chymistry of Isaac Newton*, edited by William R. Newman, Indiana U, Jun 2010, http://webapp1.dlib.indiana.edu/newton/.

Nicolson, Marjorie. *Voyages to the Moon.* Macmillan, 1948.

O'Brien, John. *Harlequin Britain: Pantomime and Entertainment, 1690–1760.* Johns Hopkins UP, 2004.

Observer [London], no. 275, 12 Mar. 1797. *17th-18th Century Burney Collection Newspapers*, Z2001395637.

O'Keeffe, John. *A Short Account of the New Pantomime called Omai; Or, A Trip round the World.* London, 1785. *Eighteenth-Century Collections Online*.

O'Quinn, Daniel. "Inchbald's Indies: Domestic and Dramatic Reorientations." *European Romantic Review,* vol. 9, no. 2, 1998, pp. 217–229.

Oring, Elliot. "Folk Narratives." *Folk Groups and Folklore Genres: An Introduction,* edited by Elliott Oring, Utah State UP, 1986.

Owen, Kate Novotny. "Dramatic Entertainments of a Mixt Kind: The Form of Mixture in Early English Pantomime." *Eighteenth-Century Studies,* vol. 48, no. 4, 2015, pp 503–520.

Oxford English Dictionary, The. 3rd ed., Oxford UP, Mar. 2001. *oed.com*.

Paige, Nicholas. "Examples, Samples, Signs: An Artifactual View of Fictionality in the French Novel, 1681–1830." *New Literary History,* vol. 48, no. 3, 2017, pp. 503–530.

Paltock, Robert. The Life and Adventures of Peter Wilkins, a Cornish Man. Berwick, 1784. Eighteenth-Century Collections Online.

Paltock, Robert. The Life and Adventures of Peter Wilkins, a Cornish Man. Dublin, 1797. Eighteenth-Century Collections Online.

Paltock, Robert. The Life and Adventures of Peter Wilkins, a Cornish Man. London, 1751. Eighteenth-Century Collections Online.

Paltock, Robert. The Life and Adventures of Peter Wilkins, a Cornish Man. London, 1783. Eighteenth-Century Collections Online.

Paltock, Robert. The Life and Adventures of Peter Wilkins, a Cornish Man. London, 1800. Eighteenth-Century Collections Online.

Paracelsus. *Liber de Nymphis, Sylphis, Pygmaeis et Salamandris et de Caeteris Spiritibus*. 1566. Francke, 1960.

"Parachutist's Record Fall: Over 25 Miles in 15 Minutes." New York Times, 24 Oct. 2014, nytimes.com/2014/10/25/science/alan-eustace-jumps-from-stratosphere-breaking-felix-baumgartners-world-record.html.

Parker's General Advertiser and Morning Intelligencer [London], no. 2224, 24 Dec. 1783. *17th-18th Century Burney Collection Newspapers*, Z2001052208.

Parker's General Advertiser and Morning Intelligencer [London], no. 2461, 02 Oct. 1784. *17th-18th Century Burney Collection Newspapers*, Z2001052818.

Paton-Williams, David. *Katterfelto: Prince of Puff.* Troubador, 2008.

Pearl, Jason. "The View from Above: Satiric Distance and the Advent of Ballooning in Britain." *Eighteenth-Century Studies*, vol. 51, no. 3, 2018, 273–87.

Pearl, Jason. *Utopian Geographies and the Early English Novel.* U of Virginia P, 2014.

Pereira, Bernadino José. *Bartolomeu de Gusmão e a Experiência Aerostática em Presença de D. João V e sua Corte*. 1940. *Museu Paulista*, São Paulo, 1-00044-0000-0000.

Peter Wilkins: or, Harlequin in the Flying World. London, 1800. *Eighteenth-Century Collections Online*, CB3326111586.

Pethers, Matthew. "'Balloon Madness': Politics, Public Entertainment, the Transatlantic Science of Flight, and Late Eighteenth-Century America." *History of Science,* vol. 48, no. 2, 2010, pp. 181–226. *OhioLINK*.

Phillips, Chelsea. "Bodies in Play: Maternity, Repertory, and the Rival *Romeo and Juliets*, 1748–51." *Theatre Survey*, vol. 60, no. 2, 2019, pp. 207–236.

Pilon, Frederick. *Aerostation; or, The Templar's Strategem. A Farce.* London, 1784. *Eighteenth-Century Collections Online.*.

Plate X. *National Air and Space Museum*, Washington, DC, A20140860000.

Poe, Edgar Allan. "The Balloon Hoax." *New York Sun*, Extra ed., 13 Apr. 1844, p. 1. *Edgar Allan Poe Society of Baltimore*, https://www.eapoe.org/works/tales/ballhxa.htm.

Poe, Edgar Allan. "The Poetic Principle." *Home Journal*, no. 36, pg. 1. *The Edgar Allan Poe Society of Baltimore*, eapoe.org/works/essays/poetprnb.htm.

"Principal Characters in the New Pantomime called Harlequin Gulliver, or the Flying Island." London, 1818. Eighteenth-Century Drama*, THM/234/1/25/2.*

Public Advertiser [London], no. 15863, 26 Mar. 1785. *17th-18th Century Burney Collection Newspapers*, Z2001189762.

Public Advertiser [London], no. 15868, 01 Apr. 1785. *17th-18th Century Burney Collection Newspapers*, Z2001189808.

Ramesey, William. *Helminthologia.* 1668. *Early English Books Online*.

Raspe, Rudolph Erich et al. *Gulliver Revived; or, The Singular Travels, Campaigns, Voyages, and Adventures of Baron Munikhouson, Commonly Called Munchausen*. 3rd ed., Oxford, 1786. *Eighteenth-Century Collections Online*, CW104102750.

Reinagle, P., and W. Sherlock. "The Perilous Situation Of Major Money. When He Fell Into The Sea With His Balloon." London, c. 1785. *National Air and Space Museum*, Washington, DC, A20140862000.

Restif de la Bretonne. *La découverte australe par un homme-volant, ou Le Dédale français*. Paris, 1781.

"Restif de la Bretonne's 1742 Flying Man." *National Air and Space Museum*, A19750726000.

Rich, John. *The Necromancer; or, Harlequin Doctor Faustus. London, 1723. Eighteenth-Century Collections Online*, CW3309997737.

Ritchie, Leslie. "Pox on Both Your Houses: The Battle of the Romeos." *Eighteenth-Century Fiction*, vol. 27, no. 3–4, 2015, pp. 373–393.

Robbins, John. "Up in the Air: Balloonomania and Scientific Performance." *Eighteenth-Century Studies,* vol. 48, no. 4, 2015, pp. 521–538.

Ruston, Sharon. *Shelley and Vitality*. Palgrave, 2005.

Sagan, Carl. *Pale Blue Dot: A Vision of the Human Future in Space*. Random, 1994, pp. 6–7. *Google Books*.

Schmidgen, Wolfram. *Exquisite Mixture: The Virtues of Impurity in Early Modern England.* U of Pennsylvania P, 2013.

Sévres Bisque Porcelain Plaques. C. 1788. *National Air and Space Museum*, Washington, DC, A19750710000, A19750709000, A19750711000, and 19750708000.

Shadwell, Thomas. *The Virtuoso.* Edited by Marjorie Hope Nicolson, U of Nebraska P, 1966.

Shanahan, John. "Theatrical Space and Scientific Space in Thomas Shadwell's *Virtuoso*." *SEL Studies in English Literature 1500–1900,* vol. 43, no. 3, 2009, pp. 549–571. *Project MUSE*.

Shanahan, John. "The Dryden-Davenant Tempest, Wonder Production, and the State of Natural Philosophy in 1667." *Eighteenth Century: Theory and Interpretation*, vol. 54, no. 1, 2013, pp. 91–118.

Shectman, Jonathan. *Groundbreaking Scientific Experiments, Inventions, & Discoveries of the 18th Century.* Greenwood P, 2003.

Shelley, Mary. *The Last Man*. London, 1826. *Hathi Trust Digital Library.*

Shelley, Percy Bysshe. "Shelley's Notes to Queen Mab." The Complete Poetry of Percy Bysshe Shelley, edited by Donald H. Reiman and Neil Fraistat, vol. 2, Johns Hopkins UP, 2004, pp. 239–316.

Shelley, Percy Bysshe. "To a balloon, laden with Knowledge." *Shelley's Poetry and Prose, edited by Donald H. Reiman and Neil Fraistat, Norton, 2002, pg. 5.*

Shelley, Percy Bysshe. *Queen Mab*. *Shelley's Poetry and Prose,* edited by Donald H. Reiman and Neil Fraistat, Norton, 2002, pp. 15–70.

Shelley, Percy Bysshe. *Shelley's Poetry and Prose*. Edited by Donald H. Reiman and Neil Fraistat, Norton, 2002.

Shelley, Percy Bysshe. *The Complete Poetry of Percy Bysshe Shelley*. Vol. 2, edited by Donald H. Reiman and Neil Fraistat, Johns Hopkins UP, 2004.

Shepherd-Barr, Kirsten. *Science on Stage: From* Doctor Faustus *to* Copenhagen. Princeton UP, 2012.

Sher, Richard. *The Enlightenment and the Book: Scottish Authors and Their Publishers in Eighteenth-Century Britain, Ireland, and America*. U of Chicago P, 2008.

Silk Fan Decorated with Balloons and Pegasus. *National Air and Space Museum*, Washington, DC, A2010474000.

Silver, James P. "The Aesthetic of Utopia in Shelley's *Queen Mab*." *A Brighter Morn: The Shelley Circle's Utopian Project, e*dited by Darby Lewes, Lexington, 2003, pp. 101–144.

Smith, Adam. *The Theory of Moral Sentiments.* Edited by Knud Haakonssen, Cambridge UP, 2002.

Söderberg, Henry. "'En machine att flyga i wädret': Emanuel Swedenborgs förslag till en flygmaskin år 1714." Daedalus [Stockholm], 1988. Sveriges Tekniska Museum, digitalamodeller.se/arsbocker/daedalus-1988/.

Söderberg, Henry. *Swedenborg's 1714 Airplane: A Machine to Fly in the Air*. Swedenborg Foundation, 1988.

Southey, Robert. *Thalaba the Destroyer: 1801*. Woodstock, 1991.

Sprat, Thomas. *The History of the Royal Society of London, For the Improving of Natural Knowledge.* London, 1667*. Google Books*.

Stone Jr., George. "*Romeo and Juliet*: The Source of Its Modern Stage Career." *Shakespeare Quarterly*, vol. 15, no. 2, 1964, pp. 191–206.

Strauss, Anselm. *Qualitative Analysis for Social Scientists.* Cambridge UP, 1987.

Stubelius, Svante. *Balloon, Flying-Machine, Helicopter: Further Studies in the History of Terms for Aircraft in English.* Göteborg, U of Göteborg, 1960.

Swedenborg machine, static model. 1961. *National Air and Space Museum*, Washington, DC, A19620060000.

Swedenborg, Emanuel. "Utkast til en Machine at flyga i wädret." *Daedalus Hyperboreus, eller några nya mathematiska och physicaliska försök*, vol. 4, 1716, pp. 80–84. *Tekniska Museet*, Stockholm, TEKA0207100.

Swedenborg, Emanuel. *Arcana Coelestia*. Vol. 8, London, 1756. *Eighteenth Century Collections Online*.

Swedenborg, Emanuel. *De Caelo et Eius Mirabilibus et de inferno, ex Auditis et Visis.* London: 1758. *Eighteenth Century Collections Online*.

Swift, Jonathan. *Gulliver's Travels. E*dited by Albert Rivero, Norton, 2002.

Taylor, John Warner. "The Sources of Shelley's 'Queen Mab'." *The Sewanee Review,* vol. 14, no. 3, 1906, pp. 324–351. *JSTOR*.

The Modern Atalantis; or, The Devil in an Air Balloon. London, 1784. Eighteenth-Century Collections Online.

Thurmond, John. *Harlequin Doctor Faustus*. London, 1724. *Eighteenth-Century Collections Online*, CW3315146746.

Tierney, James. "Advertisements for Books in London Newspapers, 1760–1785." *Studies in Eighteenth-Century Culture*, vol. 30, 2001, pp. 153–164. *Electronic Journal Center*, rave.ohiolink.edu/ejournals/article/342581546.

Times [London], no. 4777, 24 Apr. 1800. *17th-18th Century Burney Collection Newspapers*, Z2001491694.

Times [London], no. 4779, 26 Apr. 1800. *17th-18th Century Burney Collection Newspapers*, Z2001491710.

Tissandier balloon chair. 1800s. *National Air and Space Museum*, Washington, DC, A19750735000.

Tomko, Michael. "'All the World have heard of the Devil and the Pope': Elizabeth Inchbald's *The Mogul Tale* and English Catholic Satire." *Tulsa Studies in Women's Literature,* vol. 31, no. 1, 2012, pp. 117–136.

Townshend, George. A Poetical Epistle, on Major Money's Ascent in a Balloon, from the City of Norwich; and His Descent into the Sea, Seven Leagues Off Lowestoff. Norwich, 1791. Eighteenth-Century Collections Online.

Trapp, John. *A Clavis to the Bible.* 1649. *Early English Books Online*.

Trapp. *A Commentary or Exposition upon All the Epistles, and the Revelation of John the Divine.* 1647. *Early English Books Online*.

Trapp. *A Commentary or Exposition upon These Following Books of Holy Scripture.* London, 1660. *Early English Books Online*.

True Briton [London], no. 1214, 15 Nov. 1796. *17th-18th Century Burney Collection Newspapers*, Z2001562271.

Underwood, Ted. "The Science in Shelley's Theory of Poetry." *Modern Language Quarterly,* vol. 58, no. 3, 1997, pp. 299–321. *EBSCOhost*.

van der Linden, Robert. *Milestones of Flight: The Epic of Aviation with the National Air and Space Museum*. Voyageur, 2016.

Vicario, Michael A. *Shelley's Intellectual System and Its Epicurean Background*. Routledge, 2007.

Villars, Abbé de. *Comte de Gabalis; ou, Entretiens sur les sciences secretes*. 2 vols., Amsterdam, 1715. *Hathi Trust Digital Library*, hdl.handle.net/2027/mdp.39015002704248.

Villars, Abbé de. *The Count de Gabalis: Being a Diverting History of the Rosicrucian Doctrine of Spirits*. London, 1714. *Eighteenth-Century Collections Online*, CB3327019853.

Voltaire. *Micromégas.* London, 1752. *Google Books*.

Warner, Marina. *Stranger Magic: Charmed States and the Arabian Nights.* Harvard UP, 2012.

Watt, Ian. *The Rise of the Novel: Studies in Defoe, Richardson and Fielding.* 2nd ed., U of California P, 2001.

Wells, Mitchell. "Some Notes on the Early Eighteenth-Century Pantomime." *Studies in Philology,* vol. 32, no. 4, 1935, pp. 598–607.

Wheatley, Christopher J. *Without God or Reason: The Plays of Thomas Shadwell and Secular Ethics in the Restoration.* Bucknell UP, 1993.

Wichner, Jessika. "Hot Air and Chilly Welcomes: Accidental Arrivals with Balloons and Airships in the Eighteenth Century and Beyond." *Citizens of the World: Adapting in the Eighteenth Century,* edited by Samara Cahill and Kevin Cope, Bucknell UP, 2015.

Wilkins, John. *Mathematical Magick: or, The Wonders that may be Performed by Mechanical Geometry.* London, 1648. *Early English Books Online*.

Williams, David. *Royal Recollections on a Tour of Cheltenham, Gloucester, Worcester, and Places Adjacent, in the Year 1788*. London, 1788. *Eighteenth Century Collections Online*.

Wilson, F. P. "English Letters and the Royal Society in the Seventeenth Century." *The Mathematical Gazette*, vol. 19, no. 236, 1935, pp. 343–354. *JSTOR.*

Wren, John. *The Country Life*. London, 1717. *Eighteenth Century Collections Online.*