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—*Kirkus Reviews* (starred review)

"Encompassing in its coverage, robust in its artistic explanations, yet written in a smart, conversational tone, this is both a solid introduction to the man and a sweeping saga of his genius."

—*Booklist* (starred review)

LEONARDO DA VINCI

WALTER ISAACSON

Simon & Schuster Paperbacks
NEW YORK LONDON TORONTO SYDNEY NEW DELHI

Simon & Schuster Paperbacks
An Imprint of Simon & Schuster, Inc.
1230 Avenue of the Americas
New York, NY 10020

First Simon & Schuster trade paperback edition October 2018

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Interior design by Paul Dippolito

Manufactured in the United States of America

1 3 5 7 9 10 8 6 4 2

The Library of Congress has cataloged the hardcover edition as follows:
Title: Leonardo da Vinci / Walter Isaacson.
Description: New York : Simon & Schuster, 2017. |
Includes bibliographical references and index.
Identifiers: LCCN 2017020817 (print) | LCCN 2017021625 (ebook) |
ISBN 9781501139178 (ebook) | ISBN 9781501139154 (hardback) |
ISBN 9781501139161 (trade paperback)
Subjects: LCSH: Leonardo, da Vinci, 1452-1519. |
Artists--Italy--Biography. | Scientists--Italy--Biography. | Gifted persons--Italy--Biography. |
BISAC:
BIOGRAPHY & AUTOBIOGRAPHY / Artists, Architects, Photographers. |
BIOGRAPHY & AUTOBIOGRAPHY / Science & Technology. | BIOGRAPHY &
AUTOBIOGRAPHY / Historical.
Classification: LCC N6923.L33 (ebook) | LCC N6923.L33 I827 2017 (print) |
DDC 709.2 [B] --dc23
LC record available at https://lccn.loc.gov/2017020817

ISBN 978-1-5011-3915-4
ISBN 978-1-5011-3916-1 (pbk)
ISBN 978-1-5011-3917-8 (ebook)

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ACKNOWLEDGMENTS

Marco Cianchi professionally read the manuscript of this book, made many suggestions, helped with translations, and was a guide in Italy. A professor at the Accademia di Belle Arti in Florence, he has degrees in art history from the universities of Florence and Bologna. He is a longtime collaborator with Carlo Pedretti and is the author of many books, including *Le macchine di Leonardo* (Becocci, 1981), *Leonardo, I Dipinti* (Giunti, 1996), and *Leonardo, Anatomia* (Giunti, 1997). He has become a delightful friend.

Juliana Barone of Birkbeck College, University of London, was also a professional reader of much of the manuscript. She wrote her doctoral dissertation on Leonardo at Oxford and is the author of *Leonardo: The Codex Arundel* (British Library, 2008), *Studies of Motion: Drawings by Leonardo from the Codex Atlanticus* (De Agostini, 2011), *The Treatise on Painting* (De Agostini, 2014), and the forthcoming books *Leonardo, Poussin and Rubens* and *Leonardo in Britain*.

Dr. Barone was recommended to me by Martin Kemp, emeritus professor of art history at Oxford University and one of the great Leonardo scholars of our era. Over the past fifty years, he has authored or co-authored seventy-two books and scholarly articles on Leonardo. He graciously spent time with me at Trinity College, Oxford, shared with me his research findings and an early manuscript of his co-authored book *Mona Lisa: The People and the Painting* (Oxford University Press, 2017), and in countless emails offered his opinions on a variety of issues.

Frederick Schroeder, the curator of the Codex Leicester for Bill Gates, and Domenico Laurenza, an author of many books on Leonardo's engineering and inventions, read my sections on the Codex Leicester and provided me with their own updated translations from that work, scheduled for publication in 2018. David Linley took me to Windsor Castle to see the Leonardo drawings there and introduced me to the curator and Leonardo scholar Martin Clayton.

Other Leonardo scholars and curators who read parts of the manuscript, gave me access to collections, provided assistance, or offered ideas include Luke Syson, formerly of the National Gallery in London and now at the Metropolitan Museum of Art in New York City; Vincent Delieuvin and Ina Giscard d'Estaing of the Louvre; David Alan Brown of the National Gallery of Art in Washington, DC; Valeria Poletto of the Gallerie dell'Accademia in Venice; Pietro Marani of the Politecnico di Milano; Alberto Rocca of the Biblioteca Ambrosiana in Milan; and Jacqueline Thalmann of Christ Church, Oxford. I am also grateful to the staffs of the Villa I Tatti in Florence, the Dumbarton Oaks Library in Washington, DC, and the Harvard Fine Arts Library. Getty Images, led by Dawn Airey, adopted this book as a special project; the team overseeing the acquisition of images included David Savage, Eric Rachlis, Scott Rosen, and Jill Braaten. At the Aspen Institute, my deep thanks go to Pat Zindulka, Leah Bitounis, Eric Motley, Chloe Tabah, and other indulgent colleagues.

I also want to thank Filippo Dal Corno, an Aspen Italia Board Member and Milan's Councilor for Culture, who arranged a private tour of the Leonardo exhibition at Palazzo Reale with its renowned curator Pietro Marani, as well as the other delightful colleagues at Aspen Italia who helped me get access to Leonardo resources in Florence, Venice, and Milan.

All of my books for more than three decades have been published by Simon & Schuster, and that is because the team there is extraordinarily talented: Alice Mayhew, Carolyn Reidy, Jonathan Karp, Stuart Roberts (who shepherded this book and its illustrations), Richard Rhorer, Stephen Bedford, Jackie Seow, Kristen Lemire, Judith Hoover, Julia Prosser, Lisa Erwin, Jonathan Evans, and Paul Dippolito. During my entire writing career, Amanda Urban has been my agent, adviser, wise counselor, and friend. Strobe Talbott, my colleague from when I joined *Time* in 1979, has read the drafts of every one of my books, beginning with *The Wise Men*, made incisive comments, and offered encouragement; as we enter the dessert course of our careers, I savor the procession of memories that began when we were in our salad days.

As usual, my greatest gratitude goes to my wife, Cathy, and our daughter, Betsy, who are wise, smart, supportive, and very loving. Thank you.

MAIN CHARACTERS

Cesare Borgia (c. 1475–1507). Italian warrior, illegitimate son of Pope Alexander VI, subject of Machiavelli's *The Prince*, Leonardo employer.

Donato Bramante (1444–1514). Architect, friend of Leonardo in Milan, worked on Milan Cathedral, Pavia Cathedral, and St. Peter's in the Vatican.

Caterina Lippi (c. 1436–1493). Orphaned peasant girl from near Vinci, mother of Leonardo; later married Antonio di Piero del Vaccha, known as Accattabriga.

Charles d'Amboise (1473–1511). French governor of Milan from 1503 to 1511, Leonardo patron.

Beatrice d'Este (1475–1497). From Italy's most venerable family, married Ludovico Sforza.

Isabella d'Este (1474–1539). Beatrice's sister, the Marchesa of Mantua, tried to get Leonardo to paint her portrait.

Francesco di Giorgio (1439–1501). Artist-engineer-architect who worked with Leonardo on Milan's cathedral tower, traveled with him to Pavia, translated Vitruvius, and drew a version of Vitruvian man.

Francis I (1494–1547). King of France from 1515, last patron of Leonardo.

Pope Leo X, Giovanni de' Medici (1475–1521). Son of Lorenzo de' Medici, elected pope in 1513.

Louis XII (1462–1515). King of France from 1498, conquered Milan in 1499.

Niccolò Machiavelli (1469–1527). Florentine diplomat and writer, became envoy to Cesare Borgia and friend of Leonardo in 1502.

Giuliano de' Medici (1479–1516). Son of Lorenzo, brother of Pope Leo X, Leonardo's patron in Rome.

Lorenzo "the Magnificent" de' Medici (1449–1492). Banker, art patron, and de facto ruler of Florence from 1469 until his death.

Francesco Melzi (c. 1493–c. 1568). From a noble Milan family, joined Leonardo's household in 1507 and became a surrogate son and heir.

Michelangelo Buonarroti (1475–1564). Florentine sculptor and rival of Leonardo.

Luca Pacioli (1447–1517). Italian mathematician, friar, and friend of Leonardo.

Piero da Vinci (1427–1504). Florentine notary, father of Leonardo, did not marry Leonardo's mother, subsequently had eleven other children with four wives.

Andrea Salai, born Gian Giacomo Caprotti da Oreno (1480–1524). Entered Leonardo's household at age ten and was dubbed Salai, meaning "Little Devil."

Ludovico Sforza (1452–1508). De facto ruler of Milan from 1481, Duke of Milan from 1494 until his ouster by the French in 1499, patron of Leonardo.

Andrea del Verrocchio (c. 1435–1488). Florentine sculptor, goldsmith, and artist in whose workshop Leonardo trained and worked from 1466 to 1477.

CURRENCY IN ITALY IN 1500

The ducat was the gold coin of Venice. The florin was the gold coin of Florence. Both contained 3.5 grams (0.12 ounces) of gold, which would make them worth about $138 in 2017. One ducat or florin was worth approximately 7 lire or 120 soldi, which were silver coins.

NOTE REGARDING THE COVER

The cover is a detail of an oil painting in Florence's Uffizi Gallery that was once thought to be a self-portrait painted by Leonardo. Based on recent X-ray analysis, it is now considered to be a portrait of Leonardo by an unknown artist done in the 1600s. It is based on, or is the basis for, a similar portrait rediscovered in Italy in 2008, called the Lucan portrait of Leonardo da Vinci. It has been copied many times. A watercolor-on-ivory version painted in the 1770s by Giuseppe Macpherson is in the British Royal Collection and in 2017 was in the show "Portrait of the Artist" in the Queen's Gallery of Buckingham Palace.

PRIMARY PERIODS OF LEONARDO'S LIFE

Vinci
1452–1464

Florence
1464–1482

Milan
1482–1499

Florence
1500–1506

Milan
1506–1513

Rome
1513–1516

France
1516–1519

LEONARDO DA VINCI

From Leonardo's notebooks c. 1495: a sketch for *The Last Supper*, geometric studies for squaring a circle, octagonal church designs, and a passage in his mirror-script writing.

Introduction

I Can Also Paint

Around the time that he reached the unnerving milestone of turning thirty, Leonardo da Vinci wrote a letter to the ruler of Milan listing the reasons he should be given a job. He had been moderately successful as a painter in Florence, but he had trouble finishing his commissions and was searching for new horizons. In the first ten paragraphs, he touted his engineering skills, including his ability to design bridges, waterways, cannons, armored vehicles, and public buildings. Only in the eleventh paragraph, at the end, did he add that he was also an artist. "Likewise in painting, I can do everything possible," he wrote.[1]

Yes, he could. He would go on to create the two most famous paintings in history, *The Last Supper* and the *Mona Lisa*. But in his own mind, he was just as much a man of science and engineering. With a passion that was both playful and obsessive, he pursued innovative studies of anatomy, fossils, birds, the heart, flying machines, optics, botany, geology, water flows, and weaponry. Thus he became the archetype of the Renaissance Man, an inspiration to all who believe that the "infinite works of nature," as he put it, are woven together in a unity filled with marvelous patterns.[2] His ability to combine art and science, made iconic by his drawing of a perfectly proportioned man spread-eagle inside a circle and square, known as *Vitruvian Man*, made him history's most creative genius.

His scientific explorations informed his art. He peeled flesh off the faces of cadavers, delineated the muscles that move the lips, and then painted the world's most memorable smile. He studied human skulls, made layered drawings of the bones and teeth, and conveyed the skeletal agony of *Saint Jerome in the Wilderness*. He explored the mathematics of optics, showed how light rays strike the retina, and produced magical illusions of changing visual perspectives in *The Last Supper*.

By connecting his studies of light and optics to his art, he mastered the use of shading and perspective to model objects on a two-dimensional surface so they look three-dimensional. This ability to "make a flat surface display a body as if modeled and separated from this plane," Leonardo said, was "the first intention of the painter."[3] Largely due to his work, dimensionality became the supreme innovation of Renaissance art.

As he aged, he pursued his scientific inquiries not just to serve his art but out of a joyful instinct to fathom the profound beauties of creation. When he groped for a theory of why the sky appears blue, it was not simply to inform his paintings. His curiosity was pure, personal, and delightfully obsessive.

But even when he was engaged in blue-sky thinking, his science was not a separate endeavor from his art. Together they served his driving passion, which was nothing less than knowing everything there was to know about the world, including how we fit into it. He had a reverence for the wholeness of nature and a feel for the harmony of its patterns, which he saw replicated in phenomena large and small. In his notebooks he would record curls of hair, eddies of water, and whirls of air, along with some stabs at the math that might underlie such spirals. While at Windsor Castle looking at the swirling power of the "Deluge drawings" that he made near the end of his life, I asked the curator, Martin Clayton, whether he thought Leonardo had done them as works of art or of science. Even as I spoke, I realized it was a dumb question. "I do not think that Leonardo would have made that distinction," he replied.

I embarked on this book because Leonardo da Vinci is the ultimate example of the main theme of my previous biographies: how the

ability to make connections across disciplines—arts and sciences, humanities and technology—is a key to innovation, imagination, and genius. Benjamin Franklin, a previous subject of mine, was a Leonardo of his era: with no formal education, he taught himself to become an imaginative polymath who was Enlightenment America's best scientist, inventor, diplomat, writer, and business strategist. He proved by flying a kite that lightning is electricity, and he invented a rod to tame it. He devised bifocal glasses, enchanting musical instruments, clean-burning stoves, charts of the Gulf Stream, and America's unique style of homespun humor. Albert Einstein, when he was stymied in his pursuit of his theory of relativity, would pull out his violin and play Mozart, which helped him reconnect with the harmonies of the cosmos. Ada Lovelace, whom I profiled in a book on innovators, combined the poetic sensibility of her father, Lord Byron, with her mother's love of the beauty of math to envision a general-purpose computer. And Steve Jobs climaxed his product launches with an image of street signs showing the intersection of the liberal arts and technology. Leonardo was his hero. "He saw beauty in both art and engineering," Jobs said, "and his ability to combine them was what made him a genius."[4]

Yes, he was a genius: wildly imaginative, passionately curious, and creative across multiple disciplines. But we should be wary of that word. Slapping the "genius" label on Leonardo oddly minimizes him by making it seem as if he were touched by lightning. His early biographer, Giorgio Vasari, a sixteenth-century artist, made this mistake: "Sometimes, in supernatural fashion, a single person is marvelously endowed by heaven with beauty, grace, and talent in such abundance that his every act is divine and everything he does clearly comes from God rather than from human art."[5] In fact, Leonardo's genius was a human one, wrought by his own will and ambition. It did not come from being the divine recipient, like Newton or Einstein, of a mind with so much processing power that we mere mortals cannot fathom it. Leonardo had almost no schooling and could barely read Latin or do long division. His genius was of the type we can understand, even take lessons from. It was based on skills we can aspire to improve in ourselves, such as curiosity and intense observation. He had an imagi-

nation so excitable that it flirted with the edges of fantasy, which is also something we can try to preserve in ourselves and indulge in our children.

Leonardo's fantasies pervaded everything he touched: his theatrical productions, plans to divert rivers, designs for ideal cities, schemes for flying machines, and almost every aspect of his art as well as engineering. His letter to the ruler of Milan is an example, since his military engineering skills then existed mainly in his mind. His initial role at the court was not building weapons but conjuring up festivals and pageants. Even at the height of his career, most of his fighting and flying contraptions were more visionary than practical.

At first I thought that his susceptibility to fantasia was a failing, revealing a lack of discipline and diligence that was related to his propensity to abandon artworks and treatises unfinished. To some extent, that is true. Vision without execution is hallucination. But I also came to believe that his ability to blur the line between reality and fantasy, just like his sfumato techniques for blurring the lines of a painting, was a key to his creativity. Skill without imagination is barren. Leonardo knew how to marry observation and imagination, which made him history's consummate innovator.

My starting point for this book was not Leonardo's art masterpieces but his notebooks. His mind, I think, is best revealed in the more than 7,200 pages of his notes and scribbles that, miraculously, survive to this day. Paper turns out to be a superb information-storage technology, still readable after five hundred years, which our own tweets likely won't be.

Fortunately, Leonardo could not afford to waste paper, so he crammed every inch of his pages with miscellaneous drawings and looking-glass jottings that seem random but provide intimations of his mental leaps. Scribbled alongside each other, with rhyme if not reason, are math calculations, sketches of his devilish young boyfriend, birds, flying machines, theater props, eddies of water, blood valves, grotesque heads, angels, siphons, plant stems, sawed-apart skulls, tips for painters, notes on the eye and optics, weapons of war, fables, riddles, and studies for paintings. The cross-disciplinary bril-

liance whirls across every page, providing a delightful display of a mind dancing with nature. His notebooks are the greatest record of curiosity ever created, a wondrous guide to the person whom the eminent art historian Kenneth Clark called "the most relentlessly curious man in history."[6]

My favorite gems in his notebooks are his to-do lists, which sparkle with his curiosity. One of them, dating from the 1490s in Milan, is that day's list of things he wants to learn. "The measurement of Milan and its suburbs," is the first entry. This has a practical purpose, as revealed by an item later in the list: "Draw Milan." Others show him relentlessly seeking out people whose brains he could pick: "Get the master of arithmetic to show you how to square a triangle. . . . Ask Giannino the Bombardier about how the tower of Ferrara is walled. . . . Ask Benedetto Protinari by what means they walk on ice in Flanders. . . . Get a master of hydraulics to tell you how to repair a lock, canal and mill in the Lombard manner. . . . Get the measurement of the sun promised me by Maestro Giovanni Francese, the Frenchman."[7] He is insatiable.

Over and over again, year after year, Leonardo lists things he must do and learn. Some involve the type of close observation most of us rarely pause to do. "Observe the goose's foot: if it were always open or always closed the creature would not be able to make any kind of movement." Others involve why-is-the-sky-blue questions about phenomena so commonplace that we rarely pause to wonder about them. "Why is the fish in the water swifter than the bird in the air when it ought to be the contrary since the water is heavier and thicker than the air?"[8]

Best of all are the questions that seem completely random. "Describe the tongue of the woodpecker," he instructs himself.[9] Who on earth would decide one day, for no apparent reason, that he wanted to know what the tongue of a woodpecker looks like? How would you even find out? It's not information Leonardo needed to paint a picture or even to understand the flight of birds. But there it is, and, as we shall see, there are fascinating things to learn about the tongue of the woodpecker. The reason he wanted to know was because he was Leonardo: curious, passionate, and always filled with wonder.

Oddest of all, there is this entry: "Go every Saturday to the hot bath where you will see naked men."[10] We can imagine Leonardo wanting to do that, for reasons both anatomical and aesthetic. But did he really need to remind himself to do it? The next item on the list is "Inflate the lungs of a pig and observe whether they increase in width and in length, or only in width." As the *New Yorker* art critic Adam Gopnik once wrote, "Leonardo remains weird, matchlessly weird, and nothing to be done about it."[11]

To wrestle with these issues, I decided to write a book that used these notebooks as its foundation. I started by making pilgrimages to see the originals in Milan, Florence, Paris, Seattle, Madrid, London, and Windsor Castle. That followed Leonardo's injunction to begin any investigation by going to the source: "He who can go to the fountain does not go to the water-jar."[12] I also immersed myself in the little-tapped trove of academic articles and doctoral dissertations on Leonardo, each of which represents years of diligent work on very specific topics. In the past few decades, especially since the rediscovery of his Codices Madrid in 1965, there have been great advances in the analysis and interpretation of his writings. Likewise, modern technology has revealed new information about his painting and techniques.

After immersing myself in Leonardo, I did the best I could to be more observant of phenomena that I used to ignore, making a special effort to notice things the way he did. When I saw sunlight hitting drapes, I pushed myself to pause and look at the way the shadows caressed the folds. I tried to see how light that was reflected from one object subtly colored the shadows of another object. I noticed how the glint of a lustrous spot on a shiny surface moved when I tilted my head. When I looked at a distant tree and a near one, I tried to visualize the lines of perspective. When I saw an eddy of water, I compared it to a ringlet of hair. When I couldn't understand a math concept, I did the best I was able to visualize it. When I saw people at a supper, I studied the relationship of their motions to their emotions. When I saw the hint of a smile come across someone's lips, I tried to fathom her inner mysteries.

No, I did not come anywhere close to being Leonardo, mastering

his insights, or mustering a modicum of his talents. I did not get a millimeter closer to being able to design a glider, invent a new way to draw maps, or paint the *Mona Lisa*. I had to push myself to be truly curious about the tongue of the woodpecker. But I did learn from Leonardo how a desire to marvel about the world that we encounter each day can make each moment of our lives richer.

There are three major early accounts of Leonardo by writers who were almost contemporaries. The painter Giorgio Vasari, born in 1511 (eight years before Leonardo died), wrote the first real art history book, *Lives of the Most Eminent Painters, Sculptors, and Architects*, in 1550 and came out with a revised version in 1568 that included corrections based on further interviews with people who knew Leonardo, including his pupil Francesco Melzi.[13] A Florentine chauvinist, Vasari gave Leonardo and especially Michelangelo the most fulsome treatments for creating what he dubbed, for the first time in print, a "renaissance" in art.[14] As Huckleberry Finn said of Mark Twain, there were things that Vasari stretched, but he told the truth, mainly. The remainder is a mix of gossip, embellishments, inventions, and unintentional errors. The problem is knowing which picturesque anecdotes—such as Leonardo's teacher throwing down his own brush in awe of his pupil—fall into which category.

An anonymous manuscript written in the 1540s, known as the "Anonimo Gaddiano" after the family that once owned it, contains colorful details about Leonardo and other Florentines. Once again, some of the assertions, such as that Leonardo lived and worked with Lorenzo de' Medici, may be embellished, but it provides colorful details that ring true, such as that Leonardo liked to wear rose-colored tunics that reached only to his knee even though others wore long garments.[15]

A third early source is by Gian Paolo Lomazzo, a painter who became a writer when he went blind. He wrote an unpublished manuscript called *Dreams and Arguments* in about 1560 and then published a voluminous treatise on art in 1584. He was the student of a painter who had known Leonardo, and he interviewed Leonardo's pupil Melzi, so he had access to some firsthand stories. Lomazzo is espe-

cially revealing about Leonardo's sexual proclivities. In addition, there are shorter accounts contained in writings by two Leonardo contemporaries, Antonio Billi, a Florentine merchant, and Paolo Giovio, an Italian physician and historian.

Many of these early accounts mention Leonardo's looks and personality. He is described as a man of eye-catching beauty and grace. He had flowing golden curls, a muscular build, remarkable physical strength, and an elegance of bearing when he was walking through town in his colorful garb or riding on a horse. "Beautiful in person and aspect, Leonardo was well-proportioned and graceful," according to the Anonimo. In addition, he was a charming conversationalist and a lover of nature, renowned for being sweet and gentle to both people and animals.

There is less agreement about certain specifics. In the course of my research I discovered that many facts about Leonardo's life, from the site of his birth to the scene at his death, have been the subject of debate, mythology, and mystery. I try to give my best assessment and then describe the controversies and counterarguments in the notes.

I also discovered, at first to my consternation and then to my pleasure, that Leonardo was not always a giant. He made mistakes. He went off on tangents, literally, pursuing math problems that became time-sucking diversions. Notoriously, he left many of his paintings unfinished, most notably the *Adoration of the Magi*, *Saint Jerome in the Wilderness*, and the *Battle of Anghiari*. As a result, there exist now at most fifteen paintings fully or mainly attributable to him.[16]

Although generally considered by his contemporaries to be friendly and gentle, Leonardo was at times dark and troubled. His notebooks and drawings are a window into his fevered, imaginative, manic, and sometimes elated mind. Had he been a student at the outset of the twenty-first century, he may have been put on a pharmaceutical regimen to alleviate his mood swings and attention-deficit disorder. One need not subscribe to the artist-as-troubled-genius trope to believe we are fortunate that Leonardo was left to his own devices to slay his demons while conjuring up his dragons.

In one of the quirky riddles in his notebooks is this clue: "Huge figures will appear in human shape, and the nearer you get to them,

the more their immense size will diminish." The answer: "The shadow cast by a man at night with a light."[17] Although the same may be said of Leonardo, I believe he is, in fact, not diminished by being discovered to be human. Both his shadow and his reality deserve to loom large. His lapses and oddities allow us to relate to him, to feel that we might emulate him, and to appreciate his moments of triumph even more.

The fifteenth century of Leonardo and Columbus and Gutenberg was a time of invention, exploration, and the spread of knowledge by new technologies. In short, it was a time like our own. That is why we have much to learn from Leonardo. His ability to combine art, science, technology, the humanities, and imagination remains an enduring recipe for creativity. So, too, was his ease at being a bit of a misfit: illegitimate, gay, vegetarian, left-handed, easily distracted, and at times heretical. Florence flourished in the fifteenth century because it was comfortable with such people. Above all, Leonardo's relentless curiosity and experimentation should remind us of the importance of instilling, in both ourselves and our children, not just received knowledge but a willingness to question it—to be imaginative and, like talented misfits and rebels in any era, to think different.

The town of Vinci and the church where Leonardo was baptized.

CHAPTER 1

Childhood

Vinci, 1452–1464

DA VINCI

Leonardo da Vinci had the good luck to be born out of wedlock. Otherwise, he would have been expected to become a notary, like the firstborn legitimate sons in his family stretching back at least five generations.

His family roots can be traced to the early 1300s, when his great-great-great-grandfather, Michele, practiced as a notary in the Tuscan hill town of Vinci, about seventeen miles west of Florence.* With the rise of Italy's mercantile economy, notaries played an important role drawing up commercial contracts, land sales, wills, and other legal documents in Latin, often garnishing them with historical references and literary flourishes.

* Leonardo da Vinci is sometimes incorrectly called "da Vinci," as if that were his last name rather than a descriptor meaning "from Vinci." However, the usage is not as egregious as some purists proclaim. During Leonardo's lifetime, Italians increasingly began to regularize and register the use of hereditary surnames, and many of these, such as Genovese and DiCaprio, derived from family hometowns. Both Leonardo and his father, Piero, frequently appended "da Vinci" to their names. When Leonardo moved to Milan, his friend the court poet Bernardo Bellincioni referred to him in writing as "Leonardo Vinci, the Florentine."

Because Michele was a notary, he was entitled to the honorific "Ser" and thus became known as Ser Michele da Vinci. His son and grandson were even more successful notaries, the latter becoming a chancellor of Florence. The next in line, Antonio, was an anomaly. He used the honorific Ser and married the daughter of a notary, but he seems to have lacked the da Vinci ambition. He mostly spent his life living off the proceeds from family lands, tilled by sharecroppers, that produced a modest amount of wine, olive oil, and wheat.

Antonio's son Piero made up for the lassitude by ambitiously pursuing success in Pistoia and Pisa, and then by about 1451, when he was twenty-five, establishing himself in Florence. A contract he notarized that year gave his work address as "at the Palazzo del Podestà," the magistrates' building (now the Bargello Museum) facing the Palazzo della Signoria, the seat of government. He became a notary for many of the city's monasteries and religious orders, the town's Jewish community, and on at least one occasion the Medici family.[1]

On one of his visits back to Vinci, Piero had a relationship with an unmarried local peasant girl, and in the spring of 1452 they had a son. Exercising his little-used notarial handwriting, the boy's grandfather Antonio recorded the birth on the bottom of the last page of a notebook that had belonged to his own grandfather. "1452: There was born to me a grandson, the son of Ser Piero my son, on the 15th day of April, a Saturday, at the third hour of the night [about 10 p.m.]. He bears the name Leonardo."[2]

Leonardo's mother was not considered worth mentioning in Antonio's birth notation nor in any other birth or baptism record. From a tax document five years later, we learn only her first name, Caterina. Her identity was long a mystery to modern scholars. She was thought to be in her mid-twenties, and some researchers speculated that she was an Arab slave, or perhaps a Chinese slave.[3]

In fact, she was an orphaned and impoverished sixteen-year-old from the Vinci area named Caterina Lippi. Proving that there are still things to be rediscovered about Leonardo, the art historian Martin Kemp of Oxford and the archival researcher Giuseppe Pallanti of Florence produced evidence in 2017 documenting her background.[4]

Born in 1436 to a poor farmer, Caterina was orphaned when she was fourteen. She and her infant brother moved in with their grandmother, who died a year later, in 1451. Left to fend for herself and her brother, Caterina had a relationship in July of that year with Piero da Vinci, then twenty-four, who was prominent and prosperous.

There was little likelihood they would marry. Although described by one earlier biographer as "of good blood,"[5] Caterina was of a different social class, and Piero was probably already betrothed to his future wife, an appropriate match: a sixteen-year-old named Albiera who was the daughter of a prominent Florentine shoemaker. He and Albiera were wed within eight months of Leonardo's birth. The marriage, socially and professionally advantageous to both sides, had likely been arranged, and the dowry contracted, before Leonardo was born.

Keeping things tidy and convenient, shortly after Leonardo was born Piero helped to set up a marriage for Caterina to a local farmer and kiln worker who had ties to the da Vinci family. Named Antonio di Piero del Vacca, he was called Accattabriga, which means "Troublemaker," though fortunately he does not seem to have been one.

Leonardo's paternal grandparents and his father had a family house with a small garden right next to the walls of the castle in the heart of the village of Vinci. That is where Leonardo may have been born, though there are reasons to think not. It might not have been convenient or appropriate to have a pregnant and then breast-feeding peasant woman living in the crowded da Vinci family home, especially as Ser Piero was negotiating a dowry from the prominent family whose daughter he was planning to marry.

Instead, according to legend and the local tourist industry, Leonardo's birthplace may have been a gray stone tenant cottage next to a farmhouse two miles up the road from Vinci in the adjacent hamlet of Anchiano, which is now the site of a small Leonardo museum. Some of this property had been owned since 1412 by the family of Piero di Malvolto, a close friend of the da Vincis. He was the godfather of Piero da Vinci and, in 1452, would be a godfather of Piero's newborn son, Leonardo—which would have made sense if Leonardo had been born on his property. The families were very close. Leonardo's grand-

father Antonio had served as a witness to a contract involving some parts of Piero di Malvolto's property. The notes describing the exchange say that Antonio was at a nearby house playing backgammon when he was asked to come over for that task. Piero da Vinci would buy some of the property in the 1480s.

At the time of Leonardo's birth, Piero di Malvolto's seventy-year-old widowed mother lived on the property. So here in the hamlet of Anchiano, an easy two-mile walk from the village of Vinci, living alone in a farmhouse that had a run-down cottage next door, was a widow who was a trusted friend to at least two generations of the da Vinci family. Her dilapidated cottage (for tax purposes the family claimed it as uninhabitable) may have been the ideal place to shelter Caterina while she was pregnant, as per local lore.[6]

Leonardo was born on a Saturday, and the following day he was baptized by the local priest at the parish church of Vinci. The baptismal font is still there. Despite the circumstances of his birth, it was a large and public event. There were ten godparents giving witness, including Piero di Malvolto, far more than the average at the church, and the guests included prominent local gentry. A week later, Piero da Vinci left Caterina and their infant son behind and returned to Florence, where that Monday he was in his office notarizing papers for clients.[7]

Leonardo left us no comment on the circumstances of his birth, but there is one tantalizing allusion in his notebooks to the favors that nature bestows upon a love child. "The man who has intercourse aggressively and uneasily will produce children who are irritable and untrustworthy," he wrote, "but if the intercourse is done with great love and desire on both sides, the child will be of great intellect, witty, lively, and lovable."[8] One assumes, or at least hopes, that he considered himself in the latter category.

He split his childhood between two homes. Caterina and Accattabriga settled on a small farm on the outskirts of Vinci, and they remained friendly with Piero da Vinci. Twenty years later, Accattabriga was working in a kiln that was rented by Piero, and they served as witnesses for each other on a few contracts and deeds over the years. In the years following Leonardo's birth, Caterina and Accattabriga

had four girls and a boy. Piero and Albiera, however, remained childless. In fact, until Leonardo was twenty-four, his father had no other children. (Piero would make up for it during his third and fourth marriages, having at least eleven children.)

With his father living mainly in Florence and his mother nurturing a growing family of her own, Leonardo by age five was primarily living in the da Vinci family home with his leisure-loving grandfather Antonio and his wife. In the 1457 tax census, Antonio listed the dependents residing with him, including his grandson: "Leonardo, son of the said Ser Piero, *non legittimo*, born of him and of Caterina, who is now the woman of Achattabriga."

Also living in the household was Piero's youngest brother, Francesco, who was only fifteen years older than his nephew Leonardo. Francesco inherited a love of country leisure and was described in a tax document by his own father, in a pot-calling-the-kettle way, as "one who hangs around the villa and does nothing."[9] He became Leonardo's beloved uncle and at times surrogate father. In the first edition of his biography, Vasari makes the telling mistake, later corrected, of identifying Piero as Leonardo's uncle.

"A GOLDEN AGE FOR BASTARDS"

As Leonardo's well-attended baptism attests, being born out of wedlock was not a cause for public shame. The nineteenth-century cultural historian Jacob Burckhardt went so far as to label Renaissance Italy "a golden age for bastards."[10] Especially among the ruling and aristocratic classes, being illegitimate was no hindrance. Pius II, who was the pope when Leonardo was born, wrote about visiting Ferrara, where his welcoming party included seven princes from the ruling Este family, among them the reigning duke, all born out of wedlock. "It is an extraordinary thing about that family," Pius wrote, "that no legitimate heir has ever inherited the principate; the sons of their mistresses have been so much more fortunate than those of their wives."[11] (Pius himself fathered at least two illegitimate children.) Pope Alexander VI, also during Leonardo's lifetime, had multiple mistresses and illegitimate children, one of whom was Cesare Borgia,

who became a cardinal, commander of the papal armies, an employer of Leonardo, and the subject of Machiavelli's *The Prince*.

For members of the middle classes, however, illegitimacy was not as readily accepted. Protective of their new status, merchants and professionals formed guilds that enforced moral strictures. Although some of the guilds accepted the illegitimate sons of their members, that was not the case with the Arte dei Giuduci e Notai, the venerable (founded in 1197) guild of judges and notaries to which Leonardo's father belonged. "The notary was a certified witness and scribe," Thomas Kuehn wrote in *Illegitimacy in Renaissance Florence*. "His trustworthiness had to be above reproach. He had to be someone fully in the mainstream of society."[12]

These strictures had an upside. Illegitimacy freed some imaginative and free-spirited young men to be creative at a time when creativity was increasingly rewarded. Among the poets, artists, and artisans born out of wedlock were Petrarch, Boccaccio, Lorenzo Ghiberti, Filippo Lippi, his son Filippino, Leon Battista Alberti, and of course Leonardo.

Being born out of wedlock was more complex than merely being an outsider. It created an ambiguity of status. "The problem with bastards was that they were part of the family, but not totally," wrote Kuehn. That helped some be, or forced them to be, more adventurous and improvisational. Leonardo was a member of a middle-class family but separate from it. Like so many writers and artists, he grew up feeling a part of the world but also detached. This limbo extended to inheritance: a combination of conflicting laws and contradictory court precedents left it unclear whether a son born out of wedlock could be an heir, as Leonardo was to find out in legal battles with his half-brothers many years later. "Management of such ambiguities was one of the hallmarks of life in a Renaissance city-state," explained Kuehn. "It was related to the more celebrated creativity of a city like Florence in the arts and humanism."[13]

Because Florence's guild of notaries barred those who were *non legittimo*, Leonardo was able to benefit from the note-taking instincts that were ingrained in his family heritage while being free to pursue his own creative passions. This was fortunate. He would have made a

poor notary: he got bored and distracted too easily, especially when a project became routine rather than creative.[14]

DISCIPLE OF EXPERIENCE

Another upside for Leonardo of being born out of wedlock was that he was not sent to one of the "Latin schools" that taught the classics and humanities to well-groomed aspiring professionals and merchants of the early Renaissance.[15] Other than a little training in commercial math at what was known as an "abacus school," Leonardo was mainly self-taught. He often seemed defensive about being an "unlettered man," as he dubbed himself with some irony. But he also took pride that his lack of formal schooling led him to be a disciple of experience and experiment. "Leonardo da Vinci, disscepolo della sperientia,"[16] he once signed himself. This freethinking attitude saved him from being an acolyte of traditional thinking. In his notebooks he unleashed a blast at what he called the pompous fools who would disparage him for this:

> I am fully aware that my not being a man of letters may cause certain presumptuous people to think that they may with reason blame me, alleging that I am a man without learning. Foolish folk! . . . They strut about puffed up and pompous, decked out and adorned not with their own labors, but by those of others. . . . They will say that because I have no book learning I cannot properly express what I desire to describe—but they do not know that my subjects require experience rather than the words of others.[17]

Thus was Leonardo spared from being trained to accept dusty Scholasticism or the medieval dogmas that had accumulated in the centuries since the decline of classical science and original thinking. His lack of reverence for authority and his willingness to challenge received wisdom would lead him to craft an empirical approach for understanding nature that foreshadowed the scientific method developed more than a century later by Bacon and Galileo. His method was rooted in experiment, curiosity, and the ability to marvel at

phenomena that the rest of us rarely pause to ponder after we've outgrown our wonder years.

To that was added an intense desire and ability to observe the wonders of nature. He pushed himself to perceive shapes and shadows with wondrous precision. He was particularly good at apprehending movement, from the motions of a flapping wing to the emotions flickering across a face. On this foundation he built experiments, some conducted in his mind, others with drawings, and a few with physical objects. "First I shall do some experiments before I proceed further," he announced, "because my intention is to consult experience first and then with reasoning show why such experience is bound to operate in such a way."[18]

It was a good time for a child with such ambitions and talents to be born. In 1452 Johannes Gutenberg had just opened his publishing house, and soon others were using his moveable-type press to print books that would empower unschooled but brilliant people like Leonardo. Italy was beginning a rare forty-year period during which it was not wracked by wars among its city-states. Literacy, numeracy, and income were rising dramatically as power shifted from titled landowners to urban merchants and bankers, who benefited from advances in law, accounting, credit, and insurance. The Ottoman Turks were about to capture Constantinople, unleashing on Italy a migration of fleeing scholars with bundles of manuscripts containing the ancient wisdom of Euclid, Ptolemy, Plato, and Aristotle. Born within about a year of Leonardo were Christopher Columbus and Amerigo Vespucci, who would lead an era of exploration. And Florence, with its booming merchant class of status-seeking patrons, had become the cradle of Renaissance art and humanism.

CHILDHOOD MEMORIES

The most vivid memory Leonardo had of his infancy was one he recorded fifty years later, when he was studying the flight of birds. He was writing about a hawk-like bird called a kite, which has a forked tail and elegant long wings that allow it to soar and glide. Observing it with his typical acuity, Leonardo perceived precisely how it opened

its wings and then spread and lowered its tail when it landed.[19] This aroused a memory from when he was a baby: "Writing about the kite seems to be my destiny since among the first recollections of my infancy, it seemed to me that, as I was in my cradle, a kite came to me and opened my mouth with its tail and struck me several times with its tail inside my lips."[20] Like much of what came from Leonardo's mind, there was probably some fantasy and fabulism in the brew. It is hard to imagine a bird actually landing in a cradle and prying open a baby's mouth with its tail, and Leonardo appears to acknowledge this by using the phrase "it seemed to me," as if it were perhaps partly a dream.

All of this—a childhood with two mothers, an often absent father, and a dreamlike oral encounter with a flapping tail—would provide great fodder for a Freudian analyst. And it did—from Freud himself. In 1910 Freud used the kite tale as the foundation for a short book, *Leonardo da Vinci and a Memory of His Childhood*.[21]

Freud got off to a stumbling start by using a poor German translation of Leonardo's note that mistakenly called the bird a vulture rather than a kite. This sent him into a long tangential explanation about the symbolism of vultures in ancient Egypt and the etymological relationship of the words for *vulture* and *mother*, all of which was irrelevant and, Freud later admitted, embarrassing.[22] Leaving aside the bird mix-up, the main thrust of Freud's analysis was that the word for *tail* in many languages, including Italian (*coda*), is slang for "penis" and that Leonardo's memory was related to his homosexuality. "The situation contained in the fantasy, that a vulture opened the mouth of the child and forcefully belabored it with its tail, corresponds to the idea of fellatio," Freud wrote. Leonardo's repressed desires, he speculated, were channeled into his feverish creativity, but he left many works unfinished because he was inhibited.

These interpretations have prompted some devastating critiques, most famously by art historian Meyer Schapiro,[23] and they seem, at least to me, to reveal more about Freud than about Leonardo. Biographers should be cautious about psychoanalyzing someone who lived five centuries earlier. Leonardo's dreamlike memory may have simply reflected his lifelong interest in the flight of birds, which is how he

framed it. And it does not take a Freud to understand that sexual drives can be sublimated into ambition and other passions. Leonardo said so himself. "Intellectual passion drives out sensuality," he wrote in one of his notebooks.[24]

A better source for insight into Leonardo's formative character and motivations is another personal memory he recorded, this one about hiking near Florence. The recollection involved chancing upon a dark cave and pondering whether he should enter. "Having wandered some distance among gloomy rocks, I came to the mouth of a great cavern, in front of which I stood some time, astonished," he recalled. "Bending back and forth, I tried to see whether I could discover anything inside, but the darkness within prevented that. Suddenly there arose in me two contrary emotions, fear and desire—fear of the threatening dark cave, desire to see whether there were any marvelous thing within."[25]

Desire won. His unstoppable curiosity triumphed, and Leonardo went into the cave. There he discovered, embedded in the wall, a fossil whale. "Oh mighty and once-living instrument of nature," he wrote, "your vast strength was to no avail."[26] Some scholars have assumed that he was describing a fantasy hike or riffing on some verses by Seneca. But his notebook page and those surrounding it are filled with descriptions of layers of fossil shells, and many fossilized whale bones have in fact been discovered in Tuscany.[27]

The whale fossil triggered a dark vision of what would be, throughout his life, one of his deepest forebodings, that of an apocalyptic deluge. On the next side of the sheet he described at length the furious power once held by the long-dead whale: "You lashed with swift, branching fins and forked tail, creating in the sea sudden tempests that buffeted and submerged ships." Then he turned philosophical. "Oh time, swift despoiler of all things, how many kings, how many nations hast thou undone, and how many changes of states and of circumstances have happened since this wondrous fish perished."

By this point Leonardo's fears were about a realm far different from whatever dangers might be lurking inside the cave. Instead they were driven by an existential dread in the face of the destructive powers of nature. He began scribbling rapidly, using a silverpoint on

a red-tinted page, describing an apocalypse that begins with water and ends with fire. "The rivers will be deprived of their waters, the earth will no longer put forth her greenery; the fields will no more be decked with waving corn; all the animals, finding no fresh grass for pasture, will die," he wrote. "In this way the fertile and fruitful earth will be forced to end with the element of fire; and then its surface will be left burnt up to cinder and this will be the end of all earthly nature."[28]

The dark cave that Leonardo's curiosity compelled him to enter offered up both scientific discoveries and imaginative fantasies, strands that would be interwoven throughout his life. He would weather storms, literally and psychologically, and he would encounter dark recesses of the earth and soul. But his curiosity about nature would always impel him to explore more. Both his fascinations and his forebodings would be expressed in his art, beginning with his depiction of Saint Jerome agonizing near the mouth of a cave and culminating in his drawings and writings about an apocalyptic deluge.

Florence in the 1480s, the cathedral with Brunelleschi's dome in the center and the Palazzo della Signoria, the seat of government, to its right.

Chapter 2

Apprentice

THE MOVE

Until he was twelve, Leonardo had a life in Vinci that, despite the complexities of being part of an extended family, was quite settled. He lived primarily with his grandparents and his idle uncle Francesco in the family house in the heart of Vinci. His father and stepmother were listed as living there when Leonardo was five, but after that their primary residence was in Florence. Leonardo's mother and her husband lived with their growing brood of children, along with Accattabriga's parents and his brother's family, in a farmhouse an easy walk from town.

But in 1464 this world was disrupted. His stepmother, Albiera, died in childbirth, along with what would have been her first child. Leonardo's grandfather Antonio, the head of the Vinci household, also had recently died. So just as Leonardo was reaching the age when he needed to prepare for a trade, his father, living alone and probably lonely, brought him to Florence.[1]

Leonardo rarely wrote in his notebooks about his own emotions, so it is hard to know what he felt about the move. But the fables he recorded sometimes give a glimpse of his sentiments. One described the sad odyssey of a stone perched on a hill surrounded by color-

ful flowers and a grove of trees—in other words, a place like Vinci. Looking at the crowd of stones along the road below, it decided it wanted to join them. "What am I doing here among these plants?" the stone asked. "I want to live in the company of my fellow stones." So it rolled down to the others. "After a while," Leonardo recounted, "it found itself in continual distress from the wheels of the carts, the iron hoofs of horses, and the feet of the passers-by. One rolled it over, another trod upon it. Sometimes the stone raised itself up a little as it lay covered with mud or the dung of some animal, but it was in vain that it looked up at the spot whence it had come as a place of solitude and tranquil peace." Leonardo drew a moral: "This is what happens to those who leave a life of solitary contemplation and choose to come to dwell in cities among people full of infinite evil."[2]

His notebooks have many other maxims praising the countryside and solitude. "Leave your family and friends and go over the mountains and valleys into the country," he instructed aspiring painters. "While you are alone you are entirely your own master."[3] These paeans to country living are romantic and, for those who cherish the image of lonely genius, quite appealing. But they are infused with fantasy. Leonardo would spend almost all of his career in Florence, Milan, and Rome, crowded centers of creativity and commerce, usually surrounded by students, companions, and patrons. He rarely retreated alone to the countryside for an extended period of solitude. Like many artists, he was stimulated by being with people of diverse interests and (willing to contradict himself in his notebooks) declared, "Drawing in company is much better than alone."[4] The impulses of his grandfather and uncle, who both practiced the quiet country life, were imprinted in Leonardo's imagination but not practiced in his life.

During his early years in Florence, Leonardo lived with his father, who arranged for him to get a rudimentary education and would soon help him get a good apprenticeship and commissions. But there is one significant thing that Ser Piero did not do, which would have been easy enough for a well-connected notary: go through the legal process of having his son legitimated. This could be accomplished by the father and child appearing before a local official known as a

"count palatine," usually a dignitary who had been granted power to act on such matters, and presenting a petition as the child knelt.[5] Piero's decision not to do this for Leonardo is particularly surprising, since he then had no other children of his own.

Perhaps one reason that Piero did not legitimate Leonardo was that he hoped to have as his heir a son who would follow family tradition and become a notary, and it was already clear, by the time Leonardo turned twelve, that he was not so inclined. According to Vasari, Piero noticed that his son "never ceased drawing and sculpting, pursuits which suited his fancy more than any other." In addition, the notary guild had a rule, which may have been difficult to circumvent, that denied membership even to out-of-wedlock sons who had been legitimated. So Piero apparently saw no reason to go through the process. By not legitimating Leonardo, he could hope to have another son who would be his heir as a notary. A year later Piero married the daughter of another prominent Florence notary, but it would only be after his third marriage, in 1475 to a woman six years younger than Leonardo, that he would produce a legitimate heir who indeed became a notary.

FLORENCE

There was no place then, and few places ever, that offered a more stimulating environment for creativity than Florence in the 1400s. Its economy, once dominated by unskilled wool-spinners, had flourished by becoming one that, like our own time, interwove art, technology, and commerce. It featured artisans working with silk makers and merchants to create fabrics that were works of art. In 1472 there were eighty-four wood-carvers, eighty-three silk workers, thirty master painters, and forty-four goldsmiths and jewelry craftsmen working in Florence. It was also a center of banking; the florin, noted for its gold purity, was the dominant standard currency in all of Europe, and the adoption of double-entry bookkeeping that recorded debits and credits permitted commerce to flourish. Its leading thinkers embraced a Renaissance humanism that put its faith in the dignity of the individual and in the aspiration to find happiness on this earth

through knowledge. Fully a third of Florence's population was literate, the highest rate in Europe. By embracing trade, it became a center of finance and a cauldron of ideas.

"Beautiful Florence has all seven of the fundamental things a city requires for perfection," the essayist Benedetto Dei wrote in 1472, when Leonardo was living there. "First of all, it enjoys complete liberty; second, it has a large, rich, and elegantly dressed population; third, it has a river with clear, pure water, and mills within its walls; fourth, it rules over castles, towns, lands and people; fifth, it has a university, and both Greek and accounting are taught; sixth, it has masters in every art; seventh, it has banks and business agents all over the world."[6] Each one of those assets was valuable for a city, just as they are today: not only the "liberty" and "pure water," but also that the population was "elegantly dressed" and that the university was renowned for teaching accounting as well as Greek.

The city's cathedral was the most beautiful in Italy. In the 1430s it had been crowned with the world's largest dome, built by the architect Filippo Brunelleschi, which was a triumph of both art and engineering, and linking those two disciplines was a key to Florence's creativity. Many of the city's artists were also architects, and its fabric industry had been built by combining technology, design, chemistry, and commerce.

This mixing of ideas from different disciplines became the norm as people of diverse talents intermingled. Silk makers worked with goldbeaters to create enchanted fashions. Architects and artists developed the science of perspective. Wood-carvers worked with architects to adorn the city's 108 churches. Shops became studios. Merchants became financiers. Artisans became artists.[7]

When Leonardo arrived, Florence's population was 40,000, which is about what it had been for a century but down from the 100,000 or so who lived there in 1300, before the Black Death and subsequent waves of plague. There were at least a hundred families that could be considered very wealthy, plus some five thousand guild members, shopkeepers, and merchants who were part of a prosperous middle class. Because most of them were new to wealth, they had to establish and assert their status. They did so by commissioning distinctive

works of art, buying luxurious clothes of silk and gold, building palatial mansions (thirty went up between 1450 and 1470), and becoming patrons of literature, poetry, and humanist philosophy. Consumption was conspicuous but tasteful. By the time Leonardo arrived, Florence had more wood-carvers than butchers. The city itself had become a work of art. "There is no place more beautiful in all the world," the poet Ugolino Verino wrote.[8]

Unlike some city-states elsewhere in Italy, Florence was not ruled by hereditary royalty. More than a century before Leonardo arrived, the most prosperous merchants and guild leaders crafted a republic whose elected delegates met at the Palazzo della Signoria, now known as the Palazzo Vecchio. "The people were kept amused every day by shows, festivals, and novelties," the fifteenth-century Florentine historian Francesco Guicciardini wrote. "They were well fed from the provisions with which the city abounded. Industry of every sort flourished. Talented and able men were maintained, and a welcome and a position secured to all teachers of literature, art, and every liberal pursuit."[9]

The republic was not, however, democratic or egalitarian. In fact, it was barely a republic. Exercising power from behind its façade was the Medici family, the phenomenally wealthy bankers who dominated Florentine politics and culture during the fifteenth century without holding office or hereditary title. (In the following century they became hereditary dukes, and lesser family members became popes.)

After Cosimo de' Medici took over the family bank in the 1430s, it became the largest in Europe. By managing the fortunes of the continent's wealthy families, the Medici made themselves the wealthiest of them all. They were innovators in bookkeeping, including the use of debit-and-credit accounting that became one of the great spurs to progress during the Renaissance. By means of payoffs and plotting, Cosimo became the de facto ruler of Florence, and his patronage made it the cradle of Renaissance art and humanism.

A collector of ancient manuscripts who had been schooled in Greek and Roman literature, Cosimo supported the rebirth of interest in antiquity that was at the core of Renaissance humanism. He founded and funded Florence's first public library and the influential

but informal Platonic Academy, where scholars and public intellectuals discussed the classics. In art, he was a patron of Fra Angelico, Filippo Lippi, and Donatello. Cosimo died in 1464, just as Leonardo arrived in Florence from Vinci. He was succeeded by his son and then, five years later, his famous grandson, Lorenzo de' Medici, aptly dubbed Lorenzo the Magnificent.

Lorenzo had been tutored in humanist literature and philosophy under the watchful eye of his mother, an accomplished poet, and he patronized the Platonic Academy, launched by his grandfather. He was also an accomplished sportsman, distinguishing himself in jousting, hunting, falconry, and breeding horses. All of this made him a better poet and patron than he was a banker; he took more delight in using wealth than in making it. During his twenty-three-year reign, he would sponsor innovative artists, including Botticelli and Michelangelo, as well as patronize the workshops of Andrea del Verrocchio, Domenico Ghirlandaio, and Antonio del Pollaiuolo, which were producing paintings and sculptures to adorn the booming city.

Lorenzo de' Medici's patronage of the arts, autocratic rule, and ability to maintain a peaceful balance of power with rival city-states helped to make Florence a cradle of art and commerce during Leonardo's early career there. He also kept his citizenry amused with dazzling public spectacles and grandly produced entertainments, ranging from Passion Plays to pre-Lenten carnivals. The work done for these pageants was ephemeral, but it was lucrative and stimulated the creative imagination of many of the artists involved, most notably young Leonardo.

Florence's festive culture was spiced by the ability to inspire those with creative minds to combine ideas from disparate disciplines. In narrow streets, cloth dyers worked next to goldbeaters next to lens crafters, and during their breaks they went to the piazza to engage in animated discussions. At the Pollaiuolo workshop, anatomy was being studied so that the young sculptors and painters could better understand the human form. Artists learned the science of perspective and how angles of light produce shadows and the perception of depth. The culture rewarded, above all, those who mastered and mixed different disciplines.

BRUNELLESCHI AND ALBERTI

The legacy of two such polymaths had a formative influence on Leonardo. The first was Filippo Brunelleschi (1377–1446), the designer of the cathedral dome. Like Leonardo, he was the son of a notary. Desiring a more creative life, he trained to become a goldsmith. Fortunately for his wide-ranging interests, goldsmiths were lumped together with other artisans as members of the guild of silk weavers and merchants, which also included sculptors. Brunelleschi's interests soon embraced architecture as well, and he traveled to Rome to study classical ruins with his friend Donatello, another young Florentine goldsmith, who later achieved fame as a sculptor. They measured the Pantheon dome, studied other great buildings, and read the works of ancient Romans, most notably Vitruvius's paean to classical proportions, *De Architectura*. Thus they became embodiments of the multidisciplinary interests and rebirth of classical knowledge that shaped the early Renaissance.

To build his cathedral dome—a self-supporting structure of close to four million bricks that is still the largest masonry dome in the world—Brunelleschi had to develop sophisticated mathematical modeling techniques and invent an array of hoists and other engineering tools. In an example of the diverse forces that were animating creativity in Florence, some of these hoists were then used to stage Lorenzo de' Medici's magnificent theatrics involving flying characters and moving scenery.[10]

Brunelleschi also rediscovered and greatly advanced the classical concepts of visual perspective, which had been missing in the art of the Middle Ages. In an experiment that foreshadowed the work of Leonardo, he painted a panel that depicted the view of the Florence Baptistery across the plaza from the cathedral. After drilling a small hole in the panel, he put the back of it up to his eye while he faced the Baptistery. Then he took a mirror and held it at arm's length, reflecting back on the painting. As he moved the mirror in and out of his line of sight, he would compare the reflection of his painting to the real Baptistery. The essence of realistic painting, he thought, was to render a three-dimensional view onto a two-dimensional surface. After ac-

complishing this trick on a painted panel, Brunelleschi showed how parallel lines seemed to converge in the distance toward a vanishing point. His formulation of linear perspective transformed art and also influenced the science of optics, the craft of architecture, and the uses of Euclidean geometry.[11]

Brunelleschi's successor as a theorist of linear perspective was another of the towering Renaissance polymaths, Leon Battista Alberti (1404–1472), who refined many of Brunelleschi's experiments and extended his discoveries about perspective. An artist, architect, engineer, and writer, Alberti was like Leonardo in many ways: both were illegitimate sons of prosperous fathers, athletic and good-looking, never-married, and fascinated by everything from math to art. One difference is that Alberti's illegitimacy did not prevent him from being given a classical education. His father helped him get a dispensation from the Church laws barring illegitimate children from taking holy orders or holding ecclesiastical offices, and he studied law at Bologna, was ordained as a priest, and became a writer for the pope. During his early thirties, Alberti wrote his masterpiece analyzing painting and perspective, *On Painting*, the Italian edition of which was dedicated to Brunelleschi.

Alberti had an engineer's instinct for collaboration and, like Leonardo, was "a lover of friendship" and "open-hearted," according to the scholar Anthony Grafton. He also honed the skills of courtiership. Interested in every art and technology, he would grill people from all walks of life, from cobblers to university scholars, to learn their secrets. In other words, he was much like Leonardo, except in one respect: Leonardo was not strongly motivated by the goal of furthering human knowledge by openly disseminating and publishing his findings; Alberti, on the other hand, was dedicated to sharing his work, gathering a community of intellectual colleagues who could build on each other's discoveries, and promoting open discussion and publication as a way to advance the accumulation of learning. A maestro of collaborative practices, he believed, according to Grafton, in "discourse in the public sphere."

When Leonardo was a teenager in Florence, Alberti was in his sixties and spending much of his time in Rome, so it is unlikely

they spent time together. Alberti was a major influence nonetheless. Leonardo studied his treatises and consciously tried to emulate both his writing and his demeanor. Alberti had established himself as "an avatar of grace in every word or movement," a style that very much appealed to Leonardo. "One must apply the greatest artistry in three things," Alberti wrote, "walking in the city, riding a horse, and speaking, for in each of these one must try to please everyone."[12] Leonardo mastered all three.

Alberti's *On Painting* expanded on Brunelleschi's analysis of perspective by using geometry to calculate how perspective lines from distant objects should be captured on a two-dimensional pane. He also suggested that painters hang a veil made of thin thread between themselves and the objects they are painting, then record where each element falls on the veil. His new methods improved not only painting but endeavors ranging from mapmaking to stage designs. By applying mathematics to art, Alberti elevated the painter's status and advanced the argument that the visual arts deserve a standing equal to that of other humanist fields, a cause that Leonardo would later champion.[13]

EDUCATION

Leonardo's only formal learning was at an abacus school, an elementary academy that emphasized the math skills useful in commerce. It did not teach how to formulate abstract theories; the focus was on practical cases. One skill that was emphasized was how to draw analogies between cases, a method that Leonardo would use repeatedly in his later science. Analogies and spotting patterns became for him a rudimentary method of theorizing.

His enthusiastic early biographer Vasari wrote, with what seems to be typical exaggeration, "In arithmetic, during the few months that he studied it, he made so much progress, that, by continually suggesting doubts and difficulties to the master who was teaching him, he would very often bewilder him." Vasari also noted that Leonardo was interested in so many things that he got easily distracted. He turned out to be good in geometry, but he never mastered the use of equations

or the rudimentary algebra that existed at the time. Nor did he learn Latin. In his thirties he would still be trying to remedy this deficiency by drawing up lists of Latin words, painstakingly writing out awkward translations, and wrestling with grammar rules.[14]

A left-hander, Leonardo wrote from right to left on a page, the opposite direction of the words on this and other normal pages, and drew each letter facing backward. "They are not to be read save with a mirror," as Vasari described these pages. Some have speculated that he adopted this script as a code to keep his writings secret, but that is not true; it can be read, with or without a mirror. He wrote that way because when using his left hand he could glide leftward across the page without smudging the ink. The practice was not completely uncommon. When his friend the mathematician Luca Pacioli described Leonardo's mirror writing, he made the point that some other left-handers wrote likewise. A popular fifteenth-century calligraphy book even shows left-handed readers the best way to do *lettera mancina*, or mirror script.[15]

Being left-handed also affected Leonardo's method of drawing. As with his writing, he drew from right to left so as not to smudge the lines with his hand.[16] Most artists draw hatching strokes that slope upward to the right, like this: ////. But Leonardo's hatching was distinctive because his lines started on the lower right and moved upward to the left, like this: \\. Today this style has an added advantage: the left-handed hatching in a drawing is evidence that it was made by Leonardo.

When viewed in a mirror, Leonardo's writing is somewhat similar to that of his father, indicating that Piero probably helped Leonardo learn to write. However, many of his numerical calculations are written in conventional fashion, showing that the abacus school probably did not indulge his use of mirror script for math.[17] Being left-handed was not a major handicap, but it was considered a bit of an oddity, a trait that conjured up words like *sinister* and *gauche* rather than *dexterous* and *adroit*, and it was one more way in which Leonardo was regarded, and regarded himself, as distinctive.

VERROCCHIO

Around the time Leonardo was fourteen, his father was able to secure for him an apprenticeship with one of his clients, Andrea del Verrocchio, a versatile artist and engineer who ran one of the best workshops in Florence. Vasari wrote, "Piero took some of his drawings and carried them to Andrea del Verrocchio, who was his good friend, and asked if he thought it would be profitable for the boy to study drawing." Piero knew Verrocchio well, and he notarized at least four legal settlements and rental documents for him around this time. But Verrocchio probably gave the boy an apprenticeship on merit, not just as a favor to his father. He was, Vasari reported, "astonished" at the boy's talent.[18]

Verrocchio's workshop, which was nestled in a street near Piero's notarial office, was the perfect place for Leonardo. Verrocchio conducted a rigorous teaching program that involved studying surface anatomy, mechanics, drawing techniques, and the effects of light and shade on material such as draperies.

When Leonardo arrived, Verrocchio's workshop was creating an ornate tomb for the Medici, sculpting a bronze statue of Christ and Saint Thomas, designing banners of white taffeta gilded with flowers of silver and gold for a pageant, curating the Medici's antiques, and generating Madonna paintings for merchants who wanted to display both their wealth and their piety. An inventory of his shop showed that it had a dining table, beds, a globe, and a variety of books in Italian, including translated classical poetry by Petrarch and Ovid as well as humorous short stories by the fourteenth-century popular Florentine writer Franco Sacchetti. The topics of discussion in his shop included math, anatomy, dissection, antiquities, music, and philosophy. "He applied himself to the sciences, and particularly geometry," according to Vasari.[19]

Verrocchio's bottega, like those of his five or six main competitors in Florence, was more like a commercial shop, similar to the shops of the cobblers and jewelers along the street, than a refined art studio. On the ground floor was a store and workroom, open to the street, where the artisans and apprentices mass-produced products from

their easels, workbenches, kilns, pottery wheels, and metal grinders. Many of the workers lived and ate together in the quarters upstairs. The paintings and objects were not signed; they were not intended to be works of individual expression. Most were collaborative efforts, including many of the paintings commonly attributed to Verrocchio himself. The goal was to produce a constant flow of marketable art and artifacts rather than nurture creative geniuses yearning to find outlets for their originality.[20]

With their lack of Latin schooling, the artisans in such shops were not considered to be part of the cultural elite. But the status of artists was beginning to change. The rebirth of interest in the ancient Roman classics had revived the writings of Pliny the Elder, who extolled classical artists for representing nature so accurately that their grapes could fool birds. With the help of the writings of Alberti and the development of mathematical perspective, the social and intellectual standing of painters was rising, and a few were becoming sought-after names.

Trained as a goldsmith, Verrocchio left much of the brushwork of painting to others, most notably a crop of young artists that included Lorenzo di Credi. Verrocchio was a kind master; students such as Leonardo often continued to live with and work for him after their apprenticeships were completed, and other young painters, including Sandro Botticelli, became part of his circle.

Verrocchio's collegial nature did have one downside: he was not a tough taskmaster and his workshop was not renowned for delivering commissions on time. Vasari noted that Verrocchio once made preparatory drawings for a battle scene of nude figures and other narrative works of art, "but for some reason, whatever it may have been, they remained unfinished." Verrocchio held on to some paintings for years before completing them. Leonardo would far exceed his master in all things, including in his propensity to get distracted, walk away from projects, and linger over paintings for years.

One of Verrocchio's most captivating sculptures was a four-foot bronze of the young warrior David standing in triumph over the head of Goliath (fig. 1). His smile is tantalizing and a bit mysterious—What exactly is he thinking?—like the ones Leonardo would later

Fig. 1. Verrocchio's *David.*

Fig. 3. Drawing possibly of Leonardo modeling for Verrocchio's *David.*

Fig. 2. Presumed self-portrait by Leonardo in the *Adoration of the Magi.*

paint. It quavers between expressing a childlike glory and a dawning realization of future leadership; a cocky smile is caught in the moment of being transformed into resolution. Unlike Michelangelo's iconic marble statue of a muscular David as a man, Verrocchio's David seems to be a slightly effeminate and strikingly pretty boy of about fourteen.

That was the age of Leonardo, newly apprenticed in the studio, when Verrocchio probably began work on the statue.[21] Artists of Verrocchio's era typically blended the classical ideal with more naturalistic features, and it is unlikely that his statues are exact portraits

of a particular model. Nevertheless there are reasons to think that Leonardo posed for Verrocchio's *David*.[22] The face is not the usual broad type that Verrocchio had previously favored. He clearly used a new model, and the recently arrived boy in the shop was the obvious candidate, especially because, according to Vasari, young Leonardo had "a beauty of body beyond description, a splendor that rejoiced the most sorrowful souls." Such praises of young Leonardo's loveliness are echoed by his other early biographers. Another piece of evidence: David's face is similar (strong nose and chin, soft cheeks and lips) to that of a young boy Leonardo drew on the edge of the *Adoration of the Magi* that is presumed to be a self-portrait (fig. 2) as well as other supposed likenesses.

So with just a little imagination, we can look at Verrocchio's transfixing statue of the pretty boy David and envision what the young Leonardo looked like when he stood modeling on the ground floor of the studio. In addition, there is a drawing by one of Verrocchio's students that is probably a copy of a study made for the statue. It shows the boy model in exactly the same pose, down to his finger placement on his hip and the little hollow where his neck hits his collarbone, but nude (fig. 3).

Verrocchio's art was sometimes criticized as workmanlike. "The style of his sculpture and painting tended to be hard and crude, since it came from unremitting study rather than any inborn gift," Vasari wrote. But his statue of David is a beautiful gem that influenced the young Leonardo. David's curls and those of the hair and beard of Goliath's head are luxurious spirals of the type that would become a signature feature of Leonardo's art. In addition, Verrocchio's statue (unlike, say, Donatello's version in 1440) displays a care and mastery of anatomical details. For example, the two veins visible in David's right arm are accurately rendered and pop in just the precise way to show that, despite his seeming nonchalance, he is gripping his dagger-like sword very tightly. Likewise, the muscle connecting David's left forearm to his elbow is flexed in a way that comports with the twisting of his hand.

That ability to convey the subtleties of motion in a piece of still art was among Verrocchio's underappreciated talents, one that Leonardo

would adopt and then far surpass in his paintings. More than most previous artists, Verrocchio imbued his statues with twists, turns, and flows. In his bronze *Christ and Saint Thomas*, begun while Leonardo was an apprentice, Saint Thomas turns to his left to touch the wound of Jesus, who is twisting to his right as he lifts his arm. The sense of motion turns the statue into a narrative. It conveys not merely a moment but a story, the one told in the Gospel of John, when Thomas doubts the resurrection of Jesus and responds to his injunction "Reach hither thy hand, and thrust it into my side." Kenneth Clark called it "the first instance in the Renaissance of that complicated flow of movement through a composition, achieved by contrasted axes of the figures, which Leonardo made the chief motif of all his constructions."[23] We can also see Verrocchio's love of movement and flow in the hair of Saint Thomas and beard of Jesus, which again feature a sensuous profusion of spiraling curls and tight coils.

Leonardo had studied the use of math for commercial purposes at his abacus school, but from Verrocchio he learned something more profound: the beauty of geometry. After Cosimo de' Medici died, Verrocchio designed a marble-and-bronze slab for his tomb, which was finished in 1467, a year after Leonardo became his apprentice. Instead of religious imagery, the tomb slab featured geometrical patterns dominated by a circle inside a square, as Leonardo would use for his drawing *Vitruvian Man*. Inside the design, Verrocchio and his workshop carved carefully proportioned rectangles and half-circles in colors that were based on harmonic ratios and the Pythagorean musical scale.[24] There was harmony in proportions, Leonardo learned, and math was nature's brushstroke.

Geometry and harmony combined again two years later, when Verrocchio's studio was given a monumental engineering task: mounting a two-ton ball on top of Brunelleschi's dome of Florence's cathedral. It was a triumph of both art and technology. The crowning moment, which was accompanied by trumpet fanfare and hymns of praise, occurred in 1471, when Leonardo was nineteen. The project, which he would still refer to decades later in his notebook, ingrained in him a sense of the interplay between artistry and engineering; he

Fig. 4. Drapery study from Verrocchio's studio, attributed to Leonardo, c. 1470.

that tries to sort out which were done by Leonardo and which were more likely by Verrocchio, Ghirlandaio, or their coworkers.[29] The fact that the attributions are difficult to resolve is evidence of the collegial nature of Verrocchio's bottega.

For Leonardo, the drapery studies helped foster one of the key components of his artistic genius: the ability to deploy light and shade in ways that would better produce the illusion of three-dimensional volume on a two-dimensional surface. They also helped him hone his ability to observe how light subtly caresses an object, causing a glistening of luster, a sharpened contrast on a fold, or a hint of reflected glow creeping into the heart of a shadow. "The first intention of the painter," Leonardo later wrote, "is to make a flat surface display a body as if modeled and separated from this plane, and he who surpasses others in this skill deserves most praise. This accomplishment, with which the science of painting is crowned, arises from light and

shade, or we may say chiaroscuro."[30] That statement could stand as his artistic manifesto, or at least a key element of it.

Chiaroscuro, from the Italian for "light/dark," is the use of contrasts of light and shadow as a modeling technique for achieving the illusion of plasticity and three-dimensional volume in a two-dimensional drawing or painting. Leonardo's version of the technique involved varying the darkness of a color by adding black pigments rather than making it a more saturated or richer hue. In his Benois Madonna, for example, he painted the Virgin Mary's blue dress in shades ranging from almost white to almost black.

When mastering drapery drawings in Verrocchio's studio, Leonardo also pioneered sfumato, the technique of blurring contours and edges. It is a way for artists to render objects as they appear to our eye rather than with sharp contours. This advance caused Vasari to proclaim Leonardo the inventor of the "modern manner" in painting, and the art historian Ernst Gombrich called sfumato "Leonardo's famous invention, the blurred outline and mellowed colors that allow one form to merge with another and always leave something to our imagination."[31]

The term *sfumato* derives from the Italian word for "smoke," or more precisely the dissipation and gradual vanishing of smoke into the air. "Your shadows and lights should be blended without lines or borders in the manner of smoke losing itself in the air," he wrote in a series of maxims for young painters.[32] From the eyes of his angel in the *Baptism of Christ* to the smile of the *Mona Lisa,* the blurred and smoke-veiled edges allow a role for our own imagination. With no sharp lines, enigmatic glances and smiles can flicker mysteriously.

WARRIORS WITH HELMETS

In 1471, around the time the copper ball was placed atop the Duomo, Verrocchio & Co. was involved, as were most of the other artisans of Florence, in the festivities organized by Lorenzo de' Medici for the visit of Galeazzo Maria Sforza, the cruel and authoritarian (and soon-to-be-assassinated) Duke of Milan. Accompanying Galeazzo was his swarthy and charismatic younger brother Ludovico Sforza, who was

nineteen, the same age as Leonardo. (It was to him that Leonardo would address his famous job-seeking letter eleven years later.) Verrocchio's shop had two major tasks for the festivities: redecorating the Medici's guest quarters for the visitors and crafting a suit of armor and an ornate helmet as a gift.

The Duke of Milan's cavalcade was dazzling even to Florentines who were used to Medicean public spectacles. It included two thousand horses, six hundred soldiers, a thousand hunting hounds, falcons, falconers, trumpeters, pipers, barbers, dog trainers, musicians, and poets.[33] It's hard not to admire an entourage that travels with its own barbers and poets. Because it was Lent, there were three religious spectacle plays in place of public jousts and tournaments. But the overall atmosphere was far from Lenten. The visit marked the climax of the Medici practice of using public pageants and spectacles to dissipate popular discontent.

To Machiavelli, who wrote a history of Florence in addition to his famous how-to manual for authoritarian princes, the penchant for pageantry was related to a decadence that infected Florence during its period of relative peace, when Leonardo was a young artist there: "The youth having become more dissolute than before, more extravagant in dress, feasting, and other licentiousness, and being without employment, wasted their time and means on gaming and women; their principal study being how to appear splendid in apparel, and attain a crafty shrewdness in discourse. These manners derived additional encouragement from the followers of the duke of Milan, who, with his duchess and the whole ducal court, came to Florence, where he was received with pomp and respect." One church burned to the ground during the festivities, which was considered divine retribution for the fact that, as Machiavelli wrote, "during Lent, when the church commands us to abstain from animal food, the Milanese, without respect for either God or his church, ate of it daily."[34]

Leonardo's most famous early drawing may have been inspired by or related to this visit by the Duke of Milan.[35] It is of a craggy Roman warrior in profile wearing an ornate helmet (fig. 5), and it was derived from a drawing by Verrocchio, whose studio had designed a helmet as one of Florence's gifts to the duke. Intricately drawn with a

Fig. 5. A warrior.

silverpoint stylus on tinted paper, Leonardo's warrior sports a helmet adorned by a frightfully realistic bird wing and the flourishes of curls and spirals that he adored. On the breastplate is a ludicrous but loveable growling lion. The warrior's face is subtly modeled with delicate shadings made by patiently drawn hatch lines, but his jowls and brows and lower lip are exaggerated to the edge of caricature. The hooked nose and jutting jaw create a profile that became a leitmotif in Leonardo's drawings, that of a gruff old warrior, noble but faintly farcical.

The influence of Verrocchio can be clearly seen. From Vasari's *Lives* we know that Verrocchio created sculptured reliefs of "two heads in metal, one representing Alexander the Great in profile, and the other a fanciful portrait of Darius," the ancient Persian king. These are now lost but are known through various copies made at the time. Most notably, in Washington, DC's National Gallery there is a marble relief of a young Alexander the Great, attributed to Verrocchio and his workshop, which features a similar ornate helmet with a winged dragon, a breastplate adorned with a roaring face, and the profusion of curls and fluttering swirls that the master imparted to

his apprentice. In his own drawing, Leonardo eliminated a large-jawed animal that Verrocchio had perched atop the helmet, turned the dragon into swirls of plants, and generally made the design less complicated. "What Leonardo's simplifications achieved was to make the beholder's eye focus on the profile heads of the warrior and lion, i.e., on the relationship between the man and the animal," according to Martin Kemp and Juliana Barone.[36]

As with his paired carvings of Darius and Alexander, Verrocchio occasionally juxtaposed a profile of a craggy old warrior with that of a pretty boy, a theme that would become a favorite of Leonardo's, both in his drawings and in random notebook doodles. One example is in Verrocchio's *Beheading of Saint John the Baptist*, a silver relief he did for Florence's Baptistery, where a young warrior and an old one are juxtaposed on the far right. By the time this sculpture was made, starting around 1477, when Leonardo was twenty-five, it is unclear who was influencing whom; the young and old warriors facing each other, as well as an angelic young boy on the far left, have the vibrant movement and emotion-laden facial expressions that make it seem possible Leonardo had a hand in them.[37]

PAGEANTS AND PLAYS

For the artists and engineers in Florence's bottegas, working on the Medici pageants and spectacles was a significant component of their job. For Leonardo it was also a joy. He was already making a name as a colorful dresser, fond of brocade doublets and rose tunics, and as a showman adept at imaginative theatrics. Over the years, both in Florence and especially after he moved to Milan, he spent time devising costumes, theatrical scenery, stage machinery, special effects, floats, banners, and entertainments. His theatrical productions were ephemeral, and they linger only in sketches in his notebooks. They can be dismissed as diversions, but they were also an enjoyable way for him to combine art and engineering, and thus they became a formative influence on his personality.[38]

The artisans who created the sets for theatrical events became masters of the rules of artistic perspective that had been refined in the

included Botticelli, Pietro Perugino, Ghirlandaio, Pollaiuolo, Filippino Lippi, and Verrocchio himself.[41] The Compagnia had been in existence for a century, but it was undergoing a revitalization partly because artists were reacting against Florence's antiquated guild system. Under the old guild structure, they were lumped into the Arte dei Medici e Speziali, which had been founded in 1197 for physicians and pharmacists. By the late 1400s they were eager to assert a more distinctive status for themselves.

Months after becoming a master painter, Leonardo escaped the bustling narrow streets and crammed workshops of Florence and took a trip back to the rolling green hills around Vinci. "I, staying with Antonio, am contented," he scribbled in his notebook in the summer of 1473, when he was twenty-one.[42] His grandfather Antonio had died, so the reference is perhaps to his mother's husband, Antonio Buti (Accattabriga). One can picture him content as he stays with his mother and his large stepfamily in the hills just outside of Vinci; it conjures up his tale of the stone that willed itself to roll down to the crowded road but later yearned to be back up on the quiet hill.

On the reverse of that notebook page is what may be Leonardo's earliest surviving art drawing, the shimmering start of a career of combining scientific observation with artistic sensibility (fig. 7). In his mirror script he has dated it "day of Holy Mary of the Snows on the 5th August 1473."[43] The drawing is an impressionistic panorama, sketched with quick pen strokes on paper, evoking the rocky hills and verdant valley surrounding the Arno River near Vinci. There are a few familiar landmarks from the area—a conical hill, perhaps a castle—but the aerial view seems to be, typical of Leonardo, a mix of the actual and the imagined, viewed as if by a soaring bird. The glory of being an artist, he realized, was that reality should inform but not constrain. "If the painter wishes to see beauties that would enrapture him, he is master of their production," he wrote. "If he seeks valleys, if he wants to disclose great expanses of countryside from the summits of mountains, and if he subsequently wishes to see the horizon of the sea, he is lord of all of them."[44]

Other artists had drawn landscapes as backdrops, but Leonardo

Fig. 7. Leonardo's Arno Valley landscape, 1473.

was doing something different: depicting nature for its own sake. That makes his Arno Valley drawing a contender for the first such landscape in European art. The geological realism is striking: the craggy rock outcroppings eroded by the river reveal accurately rendered layers of stratified rock, a subject that was to fascinate Leonardo for the rest of his life. So, too, is the near-precision of linear perspective and the way the atmosphere blurs the distant horizon, an optical phenomenon that he would later call "aerial perspective."

Even more arresting is the young artist's ability to convey motion. The leaves of the trees and even their shadows are drawn with quick curved lines that make them seem to tremble in the breeze. The water falling into a pool is made vibrant with flutters of quick strokes. The result is a delightful display of the art of observing movement.

TOBIAS AND THE ANGEL

While working as a master painter in Verrocchio's shop during his late teens and early twenties, Leonardo contributed elements to two

paintings: he was responsible for the scampering dog and shiny fish in *Tobias and the Angel* (fig. 8) and for the angel on the far left in the *Baptism of Christ*. These collaborations show what he learned from Verrocchio and how he then surpassed him.

The biblical tale of Tobias, which was popular in late fifteenth-

Fig. 8. *Tobias and the Angel* by Verrocchio with Leonardo.

century Florence, tells of a boy who is sent by his blind father to collect a debt, accompanied by his guardian angel, Raphael. On the journey they catch a fish, the guts of which turn out to have healing powers, including that of restoring the father's sight. Raphael was the patron saint of travelers and of the guild of physicians and apothecaries. The tale of him and Tobias was particularly appealing to the wealthy merchants who had become art patrons in Florence, especially those with traveling sons.[45] Among the Florentines who painted it were Pollaiuolo, Verrocchio, Filippino Lippi, Botticelli, and Francesco Botticini (seven times).

Pollaiuolo's version (fig. 9) was produced in the early 1460s for the church of Orsanmichele. It was well known to Leonardo and Verrocchio, who was sculpting his statue of Christ and Saint Thomas for a niche of that church's wall. In producing his own *Tobias and the Angel* a few years later, Verrocchio engaged in an explicit competition with Pollaiuolo.[46]

The version that came out of Verrocchio's shop includes the exact same elements as Pollaiuolo's: Tobias and the angel walking hand in hand, a Bolognese terrier scampering alongside, Tobias holding a carp on a stick and strings, and Raphael holding a tin with the fish's guts, all in front of a meandering river landscape with clumps of grass and clusters of trees. And yet it is a fundamentally different painting, in both its impact and detail, in ways that reveal what Leonardo was learning.

One difference is that Pollaiuolo's version is stiff, while Verrocchio's conveys movement. As a sculptor, he had mastered the twists and thrusts that impart dynamism to a body. His Tobias leans in as he strides, his cloak billowing out behind him while tassels and threads flutter. He and Raphael turn to each other naturally. Even the way they hold hands is more dynamic. Whereas Pollaiuolo's faces seem vacuous, the body motions in the Verrocchio version connect to emotional expressions, conveying mental as well as physical movements.

Verrocchio, who was more of a sculptor than a painter, developed a reputation for not being a master at portraying nature. True, there is a good raptor sweeping down in his *Baptism of Christ*, but his way with animals was generally considered "indifferent" and "deficient."[47]

Fig. 9. Antonio del Pollaiuolo's *Tobias and the Angel.*

So it is not surprising that to paint the fish and dog he would turn to his pupil Leonardo, whose eye for nature was proving to be astonishing. Both animals are painted on what was already a finished background landscape; we know this because, as sometimes happened with Leonardo's experimental mixtures, his paint has become somewhat transparent.

The shiny and shimmery scales of the fish show that Leonardo was already mastering the magic of how light strikes an object and

An X-ray analysis of the painting confirms that the angel on the left and much of the background landscape and the body of Jesus were painted with multiple thin layers of oil paint, the pigments highly diluted, stroked on with great delicacy and sometimes dabbed and smoothed by fingertips, a style that Leonardo was developing in the 1470s. Oil painting had come to Italy from the Netherlands, and Pollaiuolo's workshop was using it, as was Leonardo. Verrocchio, on the contrary, never embraced the use of oils, and instead continued to use tempera, a mix of water-soluble pigments bound with egg yolks.[50]

The most striking trait of Leonardo's angel is the dynamism of his pose. Shown from slightly behind in a twisted three-quarter profile, his neck turns to the right as his torso twists slightly to the left. "Always set your figures so that the side to which the head turns is not the side to which the breast faces, since nature for our convenience has made us with a neck which bends with ease in many directions," Leonardo wrote in one of his notebooks.[51] As evident in his *Christ and Saint Thomas*, Verrocchio was a master of depicting motion in sculptures, and Leonardo became an expert in its painterly conveyance.

A comparison of the two angels shows how Leonardo was surpassing his master. Verrocchio's angel seems vacant, his face flat, and his only emotion seems to be a sense of wonder that he happens to find himself next to a much more expressive angel. "He seems to look with astonishment at his companion, as at a visitant from another world," Kenneth Clark wrote, "and, in fact, Leonardo's angel belongs to a world of the imagination which Verrocchio's never penetrated."[52]

Like most artists, Verrocchio drew lines to delineate the contours of his angel's head and face and eyes. But in Leonardo's angel, there are no clear edges that delineate the features. The curls dissolve gently into each other and the face, rather than creating a hairline. Look at the shadow underneath the jaw of Verrocchio's angel, done with visible brushstrokes of tempera paint that create a sharp jaw line. Then look at Leonardo's; the shadow is more translucent and blends more smoothly, something that's easier done with oil. The almost imperceptible strokes are fluid, thinly layered, and occasionally smoothed by hand. The contours of the angel's face are soft. There are no perceptible edges.

We can also see this beauty in the body of Jesus. Compare his legs, painted by Leonardo, with those of Verrocchio's John the Baptist. The latter have sharper lines, unlike what a careful observer would see in reality. Leonardo even minutely blurs the curls of Jesus' exposed pubic hair.

This use of sfumato, the smokiness that blurs sharp contours, was by now a hallmark of Leonardo's art. Alberti in his treatise on painting had advised that lines should be drawn to delineate edges, and Verrocchio did just that. Leonardo took care to observe the real world, and he noticed the opposite: when we look at three-dimensional objects, we don't see sharp lines. "Paint so that a smoky finish can be seen, rather than contours and profiles that are distinct and crude," he wrote. "When you paint shadows and their edges, which cannot be perceived except indistinctly, do not make them sharp or clearly defined, otherwise your work will have a wooden appearance."[53] Verrocchio's angel has this wooden appearance. Leonardo's does not.

X-ray analysis shows that Verrocchio, with his lesser feel for nature, had originally begun the background by drawing a few rounded clumps of trees and bushes, more wooden than sylvan. When Leonardo took over, he used oils to paint a richly natural view of a languid but sparkling river flowing through rocky cliffs, echoing his Arno River drawing and foreshadowing the *Mona Lisa*. Other than Verrocchio's pedestrian palm tree, the backdrop displays a magical mix of natural realism and creative fantasia.

The geological striations of the rock (except those on the far right, which someone else must have painted) are carefully rendered, though not with the subtlety that Leonardo would later display. As the scene recedes, it gradually blurs, as our eyes would naturally have it, into a hazy horizon where the blue of the sky whitens into the mists just above the hills. "The edges of the mist will be indistinct against the blue of the sky, and towards the earth it will look almost like dust blown up," Leonardo wrote in one of his notebooks.[54]

In painting the background and foreground, Leonardo created the organizing theme of the picture, which is a narrative united by the meandering river. He portrayed the water's movement with scientific mastery and spiritual profundity, imbuing it with metaphorical power

as the lifeblood connecting the macrocosm of the earth and the microcosm in humans. The water flows from the heavens and distant lakes, cuts through rocks to form dramatic cliffs and smooth pebbles, and pours from the cup of the Baptist, as if connecting to the blood of his veins. Finally, it swaddles the feet of Jesus and ripples to the edge of the picture, reaching us and making us feel a part of the flow.

There is an inexorable impetus to the water's flow, and when it is obstructed by the ankles of Jesus it forms swirls and eddies as it proceeds along its course. In these acutely observed vortexes and scientifically accurate ripples, Leonardo delights in what will become his favorite pattern: nature's spirals. The curls flowing down his angel's neck look like cascades of water, as if the river had flowed over his head and transformed into hair.

At the center of the picture is a small waterfall, one of many such depictions Leonardo would produce, in his paintings and notebooks, of water falling into a swirling pool or stream. Sometimes these renderings are scientific, at other times darkly hallucinatory. In this case the falling water seems sprightly; it causes splashes that prance around the eddies like Tobias's puppy.

With the *Baptism of Christ*, Verrocchio went from being Leonardo's teacher to being his collaborator. He had helped Leonardo learn the sculptural elements of painting, especially modeling, and also the way a body twists in motion. But Leonardo, with thin layers of oil both translucent and transcendent, and his ability to observe and imagine, was now taking art to an entirely different level. From the mist on the distant horizons to the shadow under the angel's chin to the water at the feet of Christ, Leonardo was redefining how a painter transforms and transmits what he observes.

THE ANNUNCIATION

In addition to the collaborations he did with Verrocchio in the 1470s, the twentysomething Leonardo produced at least four paintings primarily on his own while working at the studio: an Annunciation, two small devotional paintings of the Madonna and Child, and a pioneering portrait of a Florentine woman, *Ginevra de' Benci*.

Paintings of the Annunciation, which portray the moment when the angel Gabriel surprised the Virgin Mary by telling her that she would become the mother of Christ, were very popular in the Renaissance. Leonardo's version depicts the announcement and reaction as a narrative occurring in a walled garden of a stately country villa as Mary looks up from reading a book (fig. 11). Although ambitious, the painting is so flawed that its attribution to Leonardo has been debated; some experts contend that it was the product of an awkward collaboration with Verrocchio and others in his shop.[55] But a variety of evidence shows that Leonardo was the primary if not sole artist. He made a preparatory drawing of Gabriel's sleeve, and the painting exhibits his trademark style of dabbing the oil paint with his hands. His finger smudges can be seen, on very close inspection, on the Virgin Mary's right hand and on the leaves of the base of the lectern.[56]

Among the problematic elements of the picture is the bulky garden wall, which seems to be viewed from a slightly higher vantage point than the rest of the picture and distracts from the visual connection between the angel's pointing fingers and Mary's raised hand.

Fig. 11. Leonardo's *The Annunciation*.

It has an odd angle at its opening, which makes it look like it is being viewed from the right, and is jarring when compared to the wall of the house. The cloths covering the Virgin's lap have a rigidity, as if Leonardo had worked on his drapery studies a little too fastidiously, and the odd configuration of what I assume is her armchair makes it seem as if she has three knees. Her pose makes her look like a mannequin, an effect that is compounded by the blankness of her expression. The flatly rendered cypress trees are the same size, yet the one on the right, next to the house, seems closer to us and thus should be bigger. A spindly trunk of one of the cypresses seems to sprout from the angel's fingers, and the botanical exactness of the Madonna lily that the angel holds contrasts with a generic treatment of the other plants and grasses that is untypical of Leonardo.[57]

The most discomforting lapse involves the awkward positioning of Mary in relation to the ornate lectern, which was based on a tomb Verrocchio designed for the Medici. The lectern's base is a few feet closer to the viewer than Mary is, which makes it seem that she is too far away for her right arm to reach the book, yet her arm extends across it, appearing oddly elongated. This is clearly the work of a young artist. *The Annunciation* gives us an insight into what type of painter Leonardo would have been had he not gone on to immerse himself in observations of perspective and studies of optics.

On careful examination, however, the picture is not quite as bad as it looks. Leonardo was experimenting with the trick known as anamorphosis, in which some elements of a work may look distorted when viewed straight on but appear accurate when viewed from another angle. Leonardo occasionally made sketches of the technique in his notebooks. At the Uffizi, guides will suggest that you take a few steps to the right of *The Annunciation* and look again. That helps, but only partly. The angel's arm looks a bit less odd, as does the angle of the opening of the garden wall. It gets slightly better if you also squat down and view the painting from slightly lower. Leonardo was trying to create a piece that would look good to someone walking into the church from the right. He was also nudging us to the right so that we see the act of Annunciation more from Mary's vantage.[58] It almost

baby Jesus, whose folds of fat give Leonardo the chance to go beyond the drapery studies in using modeling, light, and shadows to convey realistic three-dimensionality. They become an early example of his use of chiaroscuro, the forceful contrasts of light and shade that use black pigments to alter the tone and brightness of pictorial elements rather than relying on the deepening color hues. "For the first time his chiaroscuro creates, throughout a picture, fully three-dimensional forms rivaling the roundness of sculpture," wrote David Alan Brown of Washington's National Gallery.[62]

The realistic depiction of the baby Jesus in each painting is an early example of Leonardo's art being informed by anatomical observation. "In little children, all the joints are slender and the portions between them are thick," he wrote in his notebook. "This happens

Fig. 13. *Madonna and Child with Flowers* (Benois Madonna).

because nothing but the skin covers the joints without any other flesh and has the character of sinew, connecting the bones like a ligature. And the fat fleshiness is laid on between one joint and the next."[63] This contrast is noticeable in both pictures when comparing the wrists of the Madonna with those of the infant Jesus.

In the Munich *Madonna of the Carnation*, the focus of the picture is the reaction of the newborn Jesus to the flower. The actions of his chubby arms and the emotions shown on his face are connected. He sits on a cushion adorned with crystal balls, a symbol used by the Medici family and an indication that they may have commissioned the work. The landscape seen through the windows shows Leonardo's love of combining observation with fantasy; the hazy atmospheric perspective gives a gauze of reality to jagged rocks that are purely imaginary.

The *Madonna and Child with Flowers* in Russia's Hermitage Museum also shows the lively emotions and reactions that Leonardo had learned to capture in a scene, thus turning a moment into a narrative. In this case, the baby Jesus is absorbed by the cross-shaped flower Mary is handing him, as if he is, as Brown says, "a budding botanist."[64] Leonardo had been studying optics, and he depicts Jesus carefully focusing on the flower, as if he were just learning to discern the form of an object from its background. He gently guides his mother's hands into his focus of sight. Mother and child are integrated by a narrative of reactions: that of Jesus to the flower and that of Mary delighting in the curiosity of her son.

The power of the pictures comes from the premonition that both mother and child seem to have of the crucifixion. The carnation, according to one Christian legend, sprang from the tears Mary shed at the crucifixion. In the Hermitage Museum's Benois Madonna, the symbolism is starker; the flower itself is shaped like a cross. But the psychological impact of the pictures is disappointing. Neither one shows much emotion other than curiosity on the face of Jesus and love on the face of Mary. In Leonardo's later variations on the theme, most notably his *Madonna of the Yarnwinder* and then the *Virgin and Child with Saint Anne* and its variations, he would turn the scene into a much more intense drama and emotional narrative.

Leonardo had two squirming baby models to observe when painting these pictures. After two childless marriages, his father married a third time, in 1475, and was promptly blessed with two sons, Antonio in 1476 and Giuliano in 1479. Leonardo's notebooks of the time are filled with drawings and sketches of infants in various active situations: squirming with a mother, poking at a face, trying to grab objects or pieces of fruit, and (especially) grappling in many configurations with a cat. Depictions of the Madonna trying to restrain her restless baby would become an important theme in Leonardo's art.

GINEVRA DE' BENCI

Leonardo's first nonreligious painting is the portrait of a melancholy young woman with a moonlike face glowing against the backdrop of a spiky juniper tree (fig. 14). Although somewhat listless and unengaging on first glance, *Ginevra de' Benci* has wonderful Leonardo touches, such as the lustrous, tightly curled ringlets of hair and unconventional three-quarters pose. More important, the picture presages the *Mona Lisa*. As he had done in Verrocchio's *Baptism of Christ*, Leonardo depicts a meandering river flowing from the misty mountains and seeming to connect to a human body and soul. With her earth-tone dress laced by blue thread, Ginevra is unified with the earth and the river that joins them.

Ginevra de' Benci was the daughter of a prominent Florentine banker whose aristocratic family was allied with the Medici and second only to them in wealth. In early 1474, when she was sixteen, she married Luigi Niccolini, who at thirty-two was a recent widower. His family, which was in the cloth-weaving business, was politically prominent but not as wealthy; he soon became the chief magistrate of the republic, but in a 1480 tax return he declared that he had "more debts than property." The return also said that his wife was ill and had been "in the hands of doctors for a long time," which could account for the unnerving pallor of her complexion in the portrait.

It is likely that Leonardo's father helped him get the commission, probably around the time of Ginevra's 1474 marriage. Piero da

Fig. 14. *Ginevra de' Benci.*

Vinci had served as notary for the Benci family on many occasions, and Leonardo had become friends with Ginevra's older brother, who lent him books and would end up as a temporary custodian of his unfinished *Adoration of the Magi*. But it does not seem that *Ginevra de' Benci* was commissioned as a wedding or betrothal portrait. It shows a three-quarter pose rather than the side profile that was typical of the genre, and she is dressed in a starkly plain brown dress unadorned by

jewelry rather than one of the elaborate dresses with luxurious jewels and brocades that was then common for an upper-class wedding painting. Her black shawl is an unlikely adornment for a celebration of a marriage.

In an oddity of Renaissance culture and mores, the picture may not have been commissioned by the Benci family but instead by Bernardo Bembo, who became Venice's ambassador to Florence at the beginning of 1475. He was forty-two at the time and had both a wife and a mistress, but he struck up a proudly public Platonic relationship with Ginevra that made up in effusive adoration what it likely lacked in sexual consummation. This was a type of elevated romance that, at that time, was not only sanctioned but celebrated in poems. "It is with these flames and with such a love that Bembo is on fire and burns, and Ginevra dwells in the midst of his heart," the Florentine Renaissance humanist Cristoforo Landino wrote in a verse extolling their love.[65]

Leonardo painted Bembo's emblem of a laurel and palm wreath on the reverse of the portrait, and it encircles a sprig of juniper, in Italian *ginepro* and thus a reference to Ginevra's name. Woven through the wreath and juniper sprig is a banner proclaiming, "Beauty Adorns Virtue," which attests to her virtuous nature, and an infrared analysis shows Bembo's motto, "Virtue and Honor," had been written beneath it. Suffused with the muted and misty dusk light that Leonardo loved, the painting shows Ginevra looking pale and melancholy. There is a vacant trance-like quality to her, echoed by the dreamlike quality of the distant landscape, that seems to go deeper than merely the physical illness her husband reported.

The portrait, which is more closely focused and sculptural than others of the era, resembles a bust sculpted by Verrocchio, *Lady with Flowers*. The comparison would be even closer except that the bottom portion of Leonardo's painting, perhaps as much as one-third, was at some later date lopped off, which removed what writers from the period described as gracious hands with ivory-white fingers. Fortunately we perhaps can imagine how they looked, since a silverpoint drawing by Leonardo, showing folded hands holding a sprig, which may be related to his painting, exists in the collection at Windsor.[66]

Chapter 3

On His Own

L'AMORE MASCULINO

In April 1476, a week before his twenty-fourth birthday, Leonardo was accused of engaging in sodomy with a male prostitute. It happened around the time that his father finally had another child, a legitimate son who would become his heir. The anonymous allegation against Leonardo was placed in a *tamburo*, one of the letter drums designated for receipt of morals charges, and involved a seventeen-year-old named Jacopo Saltarelli, who worked in a nearby goldsmith shop. He "dresses in black," the accuser wrote of Saltarelli, "is party to many wretched affairs, and consents to please those persons who request such wickedness of him." Four young men were accused of engaging his sexual services, among them "Leonardo di Ser Piero da Vinci, who lives with Andrea de Verrocchio."

The Officers of the Night, who policed such charges, launched an investigation and may have imprisoned Leonardo and the others for a day or so. The charges could have led to serious criminal penalties if any witnesses were willing to come forward. Fortunately, one of the other four young men was a member of a prominent family that had married into the Medici clan. The case was dismissed "with the condition that no further accusations are made." But a few weeks later,

a new accusation was made, this one written in Latin. It said that the four had engaged in multiple sexual engagements with Saltarelli. Because it too was an anonymous allegation and no witnesses came forth to corroborate it, the charges were once again set aside with the same conditions. That, apparently, was the end of the matter.[1]

Thirty years later, Leonardo wrote a bitter comment in a notebook: "When I made a Christ-child you put me in prison, and now if I show him grown up you will do worse to me." The comment is cryptic. Perhaps Saltarelli had modeled for one of his depictions of a young Jesus. At the time, Leonardo felt abandoned. "As I have told you before, I am without any of my friends," he wrote in a note. On the reverse is this: "If there is no love, what then?"[2]

Leonardo was romantically and sexually attracted to men and, unlike Michelangelo, seemed to be just fine with that. He made no effort either to hide or proclaim it, but it probably contributed to his sense of being unconventional, someone who wasn't geared to be part of a family procession of notaries.

Over the years, he would have many beautiful young men as part of his studio and household. Two years after the Saltarelli incidents, on a page with one of his many notebook doodles of an older man and a beautiful boy facing each other in profile, he wrote, "Fioravante di Domenico of Florence is my most beloved friend, as though he were my . . ."[3] The sentence is unfinished, but it leaves the impression that Leonardo had found an emotionally satisfying companion. Shortly after this note, the ruler of Bologna wrote to Lorenzo de' Medici about another young man, who had worked with Leonardo and even adopted his name, Paulo de Leonardo de Vinci da Firenze.* Paulo had been sent away from Florence because of the "wicked life he had led there."[4]

One of Leonardo's earliest male companions was a young musi-

* That type of name change was not uncommon for apprentices. A contemporary of Leonardo, the Florentine painter Piero di Cosimo, for example, took his name from his master, Cosimo Rosselli. Leonardo, tellingly, did not do the same and always used his own father's name as part of his full name, Leonardo di ser Piero da Vinci.

cian in Florence named Atalante Migliorotti, whom he taught to play the lyre. Atalante was thirteen in 1480, and around that time Leonardo drew what he described as "a portrait of Atalante raising his face" as well as a full-length sketch of a nude boy from behind playing the lyre.[5] Two years later, Atalante would accompany him to Milan and eventually go on to a successful music career. He would star in a 1491 opera production in Mantua and then make for that city's ruling family a twelve-stringed lyre of "unusual shape."[6]

Leonardo's most serious longtime companion, who joined Leonardo's household in 1490, was angelic looking but devilish in personality, and thus acquired the nickname Salai, the Little Devil. Vasari described him as "a graceful and beautiful youth with fine curly hair in which Leonardo greatly delighted," and he was the subject of many sexual comments and innuendos, as we shall see.

Leonardo was never known to have had a relationship with a woman, and he occasionally recorded his distaste for the idea of heterosexual copulation. He wrote in one of his notebooks, "The sexual act of coitus and the body parts employed for it are so repulsive that, if it were not for the beauty of the faces and the adornment of the actors and the pent-up impulse, nature would lose the human species."[7]

Homosexuality was not uncommon in the artistic community of Florence or in Verrocchio's circle. Verrocchio himself never married, nor did Botticelli, who was also charged with sodomy. Other artists who were gay included Donatello, Michelangelo, and Benvenuto Cellini (who was twice convicted of sodomy). Indeed, *l'amore masculino*, as Lomazzo quoted Leonardo calling it, was so common in Florence that the word *Florenzer* became slang in Germany for "gay." When Leonardo worked for Verrocchio, a cult of Plato was arising among some Renaissance humanists, and it included an idealized view of erotic love for beautiful boys. Homosexual love was celebrated in both uplifting poems and bawdy songs.

Nevertheless, sodomy was a crime, as Leonardo became painfully aware, and it was sometimes prosecuted. During the seventy years following the creation of the Officers of the Night in 1432, an average of four hundred men per year were accused of sodomy, and about sixty

per year were convicted and sentenced to prison, exile, or even death.[8] The Church considered homosexual acts a sin. A 1484 papal bull likened sodomy to "carnal knowledge with demons," and preachers regularly railed against it. Dante, whose *Divine Comedy* was beloved by Leonardo and illustrated by Botticelli, consigned sodomites, along with blasphemers and usurers, to the seventh circle of hell. However, Dante displayed Florence's conflicted feelings about homosexuals by praising in the poem one of the denizens he put into this circle, his own mentor, Brunetto Latini.

Some writers, following Freud's unsubstantiated assertions that Leonardo's "passive homosexual" desires were "sublimated," have speculated that his desires were repressed and channeled into his work. One of his maxims seems to give support to the theory that he believed in controlling his sexual urges: "Whoever does not curb lustful desires puts himself on the level of beasts."[9] But there is no reason to believe that he remained celibate. "Those who wish, in the interest of morality, to reduce Leonardo, that inexhaustible source of creative power, to a neutral or sexless agency, have a strange idea of doing service to his reputation," wrote Kenneth Clark.[10]

On the contrary, in his life and in his notebooks, there is much evidence that he was not ashamed of his sexual desires. Instead he seemed amused by them. In a section of his notebooks called "On the Penis," he described quite humorously how the penis had a mind of its own and acted at times without the will of the man: "The penis sometimes displays an intellect of its own. When a man may desire it to be stimulated, it remains obstinate and goes its own way, sometimes moving on its own without the permission of its owner. Whether he is awake or sleeping, it does what it desires. Often when the man wishes to use it, it desires otherwise, and often it wishes to be used and the man forbids it. Therefore it appears that this creature possesses a life and an intelligence separate from the man." He found it curious that the penis was often a source of shame and that men were shy about discussing it. "Man is wrong to be ashamed of giving it a name or showing it," he added, "always covering and concealing something that deserves to be adorned and displayed with ceremony."[11]

How was this reflected in his art? In his drawings and notebook sketches, he showed a far greater fascination for the male body than the female. His drawings of male nudes tend to be works of tender beauty, many rendered in full length. By contrast, almost all of the women he painted, with the exception of a now lost *Leda and the Swan*, are clothed and shown from the waist up.*

Nevertheless, unlike Michelangelo, Leonardo was a master at painting women. From *Ginevra de' Benci* to the *Mona Lisa*, his portraits of women are deeply sympathetic and psychologically insightful. His *Ginevra* is innovative, at least for Italy, by ushering in a three-quarter view for women's poses rather than the full profile that was standard. This allows viewers to look at the eyes of the woman, which, as Leonardo declared, are "the window of the soul." With *Ginevra* women were no longer presented as passive mannequins but were shown as people with their own thoughts and emotions.[12]

On a deeper level, Leonardo's homosexuality seems to have been manifest in his sense of himself as somewhat different, an outsider who didn't quite fit in. By the time he was thirty, his increasingly successful father was an establishment insider and a legal adviser to the Medici, the top guilds, and churches. He was also an exemplar of traditional masculinity; by then he'd had at least one mistress, three wives, and five children. Leonardo, on the contrary, was essentially an outsider. The birth of his half-siblings reinforced the fact that he was not considered legitimate. As a gay, illegitimate artist twice accused of sodomy, he knew what it was like to be regarded, and to regard yourself, as different. But as with many artists, that turned out to be more an asset than a hindrance.

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* Another possible exception, in addition to the probable *Leda and the Swan*, may have been a half-nude version of the *Mona Lisa*, which does not survive in his own hand but exists in versions by others in his studio. In his series of anatomical drawings, he drew a woman's anatomy, which has a crude and flawed depiction of female genitalia, looking like a forbidding and dark cave. This was a case of not letting experience be a mistress, or vice versa.

Fig. 15. *Adoration of the Magi.*

outside the walls of Florence. Once again his father helped. Piero da Vinci was a notary for the monks and bought his firewood from them. That year he was given two chickens for work he had done, which included negotiating a complex contract for his son to paint the *Adoration* as well as to decorate the face of the monastery's clock.[18]

His father was clearly worried, like the parents of many twenty-somethings over the ages, about his talented child's work habits. The monks were as well. The elaborate contract was designed to force Leonardo, already known for leaving paintings unfinished, to buckle