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PREFACE
True Confessions of an Aging Archivist

In 1968, when I was offered—and promptly accepted—a position as Caltech's first archivist, I had heard of the physicist Richard Feynman, but pretty much nothing else. To develop a sense of history about a place takes time and when people on campus began to call me "the school historian," I felt embarrassed by the title—I didn't feel ready to accept that designation. After all, many renowned faculty members had spent their entire careers at Caltech. They had all known Millikan, Hale, and Noyes, Caltech's founding trio, personally. If I am often consulted as the "school's memory," for lack of a better phrase, it's because the faculty ranks of my generation have thinned, while I remain. In any event, I am no longer embarrassed.

To cast back several decades, 1979 was a banner year for Einstein celebrations. It seemed that everyone in Los Angeles wanted to share in his hundredth birthday, including KCET, the local public television station, which asked that Caltech's archivist come down to its Hollywood studio for a live interview about the iconic scientist, who had spent a couple of winters at the campus in the early 1930s. "Remember to tell them what an archivist does," my teenage daughter suggested. As a graduate student, I had written my dissertation on Sir Humphry Davy, a chemist who came to prominence at the beginning of the nineteenth century. However, starting out as an archivist in 1968, I had only a foggy idea what such a person was supposed to do. One of the more distinguished historians on the faculty had suggested that an archivist could spend their days preparing brief biographies of other faculty members. After due consideration, I have decided not to reveal who proposed that job description.

By Einstein's centennial year, I figured I had the job of being the Institute's archivist more or less down to a science—after all, I was at a premier science institution. The formula was simple: first, you need to decide what should be preserved, and second, you need to do whatever it takes to preserve it. When my KCET host began the interview by asking what an archivist does all day, I was ready with that answer.

The Caltech Archives today is the culmination of that simple but far from simple-minded approach to assembling, classifying, and curating the wealth of historic Caltech material featured in curator Claudia Bohn-Spector and project director Peter Sachs Collopy's lavish exhibition on display at a select number of sites on campus. With more than 500,000 objects dating from antiquity to the present day to choose from, they have mined the Archives' substantial holdings of scientific instruments, models, paintings, rare books and prints, drawings, seals, and photographs to highlight the role and function of art in areas that the Institute's founders saw, and what continues to be seen, as the most important fields at the frontiers of science and technology.

The records of the Human Betterment Foundation, perhaps the most controversial and, in recent years, among the Archives' most consulted research collections, were transferred from the Institute's Waverly warehouse to the Archives in 1968, shortly after I was told that inactive records and files were routinely sent there for further retention or destruction. The papers of Ezra S. Gosney, the HBF founder and principal donor, were either strewn across the floor or stored in dozens of boxes, and they were clearly marked "destroy." Given the recent controversy surrounding Robert Millikan's membership on the foundation's board in the late 1930s, perhaps it would have been better to have left them there. But I knew that the records would provide historians with essential source material for examining the eugenics movement in America, starting with the personal and social impact of sterilization carried out under California's first sterilization law in 1909 and its revision in 1913. Beyond those records, I found nothing else of interest in the Waverly warehouse.

As late as the mid-1950s the majority of Caltech's library holdings were clearly geared toward meeting the contemporary needs of its science and engineering faculty and students, although I can remember checking out a well-thumbed English-language copy, published in 1790, of eighteenth-century French chemist Antoine Lavoisier's *Elementary Treatise on Chemistry*, which had sat on the open shelves in the school's chemistry library for decades. Then, like a sudden downpour in summer, rare first editions of landmark texts in the history of science began raining down on the campus. Collectively, these priceless volumes are among the Archives'—and Caltech's—crown jewels. They were assembled early in the twentieth century, in Florence, Italy, by Giampaolo Rocco, a prince with an engineering degree.

Mostly rebound in blue morocco leather and embossed with his family's coat of arms on the cover, Rocco's holdings—consisting primarily of astronomy and physics texts published in the sixteenth and seventeenth centuries—arrived at Caltech in 1955. It may have been the only time in the school's history that a trustee was persuaded to write a check, sight unseen, for 202 books, based solely on a published list prepared by a prince's private librarian.[1]

Ostensibly, the Rocco collection was intended for Earnest C. Watson, a long-time member of Caltech's physics faculty, whose deep interest in books, manuscripts, pictures, and instruments relating to the history of science had by the mid-1930s turned him into an avid collector. Shortly after the volumes arrived, Watson turned them over to Caltech, not simply because they represented, in his eyes, a good investment, but also as a reminder that the pursuit of science is far older than the institution that stands today at the pinnacle of scientific achievement. He would go on to supplement the Rocco collection with many of his own rare first editions.

The designers and publishers of these works were not themselves scientists, but they were craftspeople, artisans, and illustrators of the highest order, who, like many of the works' authors, clearly had a keen appreciation of the value of art in illuminating scientific concepts.[2] One of these volumes, by the first chancellor of Oxford University and bishop of Lincoln and one of the medieval world's most celebrated thinkers, Robert Grosseteste (ca. 1168–1253), is Caltech's oldest dated book, published in 1503 in Nuremberg. This short work, *Concerning Lines, Angles, and Figures, and the Refraction and Reflection of Rays*, is the first printed edition of his geometrical analysis of light. The woodcut frontispiece shows a tree in a tub of water to demonstrate refraction. Meanwhile, reflected rays of the sun shining into a mirror cause a tree in the distance to burst into flame (page 10). (Like the four volumes described below, this exceedingly rare first edition was gifted to Caltech by Earnest Watson.)

Three centuries after Grosseteste, the seeds of modern science began to blossom. Even a modest tour of the scientific and visual gems in Caltech's rare book collection must include the Polish astronomer (and Catholic canon) Nicholas Copernicus's earth-shattering view of the solar system. In his book *On the Revolutions of the Heavenly Spheres* (Nuremberg, 1543), which he saw in published form and handled shortly before he died, Copernicus placed the sun rather than the earth at the center of the natural order. His description of the heliocentric solar system is accompanied by one of the most famous illustrations in the history of science: a drawing of the six known planets orbiting the sun (page 74). Overthrowing fourteen centuries of traditional thought, Copernicus's revolutionary model, based on literal revolutions in the sky, launched the scientific revolution that would lead, some 150 years later, to the publication of Isaac Newton's *Principia* and the dawn of the Age of Enlightenment. (A rare second edition of this pivotal work in the history of science is also part of the Caltech collection.)

Born not long after Copernicus's death, the Danish nobleman Tycho Brahe (1546–1601), the last dedicated astronomer not to use a telescope, spent much of his life carrying out the most detailed observations then possible of the heavens, largely with instruments of his own invention. He accomplished all this at observatories he had constructed on the island

Robert Grosseteste
Libellus lincolniensis de phisicis lineis angulis et figuris..., 1503
Book (detail)
Caltech Archives and Special Collections

of Ven, which King Frederick II of Denmark gave him in 1576. A stunning series of color illustrations in cartographer Joan Blaeu's *Atlas Maior* (Amsterdam, 1662) offers a panoramic view of Tycho's astronomical kingdom. One picture shows *Uraniborg*—named for Urania, the muse of astronomy—a complex of buildings that included observatories, a laboratory, a printing shop for publications, and living quarters, all enclosed within an elaborate wall. Another hand-colored print in the same volume depicts Tycho's observatory *Stellaborg*, situated outside the walls of *Uraniborg* and, as its name implies, designed for stargazing. Partially constructed underground to protect its astronomical instruments from wind and other disturbances, the building's occupants can be observed in the lower right using a sextant (a type of navigational instrument) to measure the distances between celestial bodies (below).

A contemporary of Tycho, Johann Bayer (1572–1625) published *Uranometria*, the first true star atlas, in 1603. The most famous of all celestial atlases, it consists of 51 constellation maps of the night sky engraved on copper plates. Recognized for their outstanding beauty to this day, the maps remained a popular guide to the constellations for more than two hundred years.

German astronomer and mathematician Johannes Kepler (1571–1630) and his Italian counterpart Galileo Galilei (1564–1642) were both staunch Copernicans. In an early bid to unmask the hidden design of the universe, Kepler devised a model demonstrating how each of the five "perfect solids" of antiquity could be neatly interposed between the spheres of the six planets then known in the Copernican system. A famous drawing of these nested solids (the outermost sphere is Saturn's) appears in his book *The Secret of the Universe,* published in 1596 (page 74). Thirteen years later, Kepler abandoned this idea with his discovery that the orbit of Mars was elliptical. *The New Astronomy* (1609) sets forth his thesis that the orbits of all the planets are ellipses with the sun at one focus, a proposition now known as Kepler's first law of planetary motion (page 75). (This work, like the astronomy volumes discussed below, came to Caltech with the Rocco collection.)

In 1627, under the patronage of Holy Roman Emperor Rudolph II, Kepler published the *Rudolphine Tables* (cultivating benefactors was as essential to scientists in those days as it is today, if not more so), a set of planetary tables and star charts. Kepler himself designed the book's frontispiece, an elaborate engraving depicting those he considered the giants of astronomy, both ancient and among his contemporaries, gathered in the temple of Urania. He placed himself and the titles of four of his books in the left panel on the base of the temple.

Caltech's copy of the *Rudolphine Tables* also includes a fine seventeenth-century map of the world, prepared by Kepler and cartographers Eckebrecht and Walch, and dated Nuremberg 1630. As with other maps of that era, California is drawn as an island.

The invention of the telescope in 1610 marked the end of the era of naked-eye astronomy. The first to grasp that the telescopic lens might be used to study the night sky was Galileo, and *Starry Messenger* —the book in which he published his findings—marked the birth of telescopic

Tycho Brahe
Astronomiae instauratae mechanica, 1602
Book (detail)
Caltech Archives and Special Collections

observations of the heavens. One of Galileo's earliest discoveries was of the craters and mountains on the moon, and *Starry Messenger* contains his hand-drawn pictures of them (page 76). But if the moon had mountains, like the earth, then the Aristotelian view of corrupt bodies on the earth and perfect, unchanging celestial bodies fell apart. There were other spectacular discoveries: Venus exhibited phases like the moon; Jupiter had four moons. Their existence lent weight to the Copernican theory by providing indisputable visual evidence of satellites moving around a planet as the planets moved around the sun.

There are important books in the history of science canon, and then there is Galileo's *Dialogue Concerning the Two Chief World Systems*, one of the great masterpieces of the scientific revolution. His defense of the Copernican theory in this book (and his sarcastic treatment of its critics, which included a number of influential Roman Catholic clergy) resulted in a summons to Rome, where Galileo was brought to trial before the Inquisition and sentenced to permanent house arrest. The edition in the Archives, published in Florence in 1632, is exceedingly rare and contains both the proof and the final version of the book's frontispiece. The elegant engraving by Stefano della Bella depicts Aristotle, Ptolemy, and Copernicus debating their respective theories of Earth's position in the cosmos.

In 2000, the late Caltech Professor George Housner, a pioneering earthquake engineer, donated his extensive collection of historical books and prints relating to earthquakes to the Archives. Among them are a series of exquisite woodblock prints created after the great Tokyo quake of 1855. They depict scenes in the life of *namazu*—the giant catfish whose unpredictable actions Japanese folklore held to be the cause of earthquakes (page 98).

Some decades before the Archives began acquiring its rare book collection, physicist Robert Millikan, who had recently become the de facto head of Caltech, made his own effort to enlist art in the service of science. In 1923 he commissioned Belgian artist Godefroid Devreese to create a representational work that, in Millikan's words, would serve "for a thousand years to come . . . [as] the symbol by which the California Institute will be most widely known." According to various archival records, Millikan asked Devreese to design a seal that would show an older man passing the torch to a younger one. He wanted the figures to symbolize the spirit of research being passed from one generation to the next, from maturity to youth. Devreese duly produced a design depicting the older torch-bearing male sprinting toward the younger as in a relay race, both unclad in the manner of antiquity and floating in the clouds (page 256).

Appearing above these two figures, the seal's motto "The truth shall make you free," also chosen by Millikan, comes from the New Testament's Gospel of John. Taken in the context of the emblem—the passing on of knowledge—Caltech's first Nobel laureate seemed to be endorsing scientific truth. Moreover, as a minister's son and an ardent proponent of the idea that science and religion need not be in conflict, the biblical excerpt probably struck him as appropriate.

Millikan evidently liked the emblem, referring to it as Caltech's official seal. In 1925, Caltech's executive council, which he headed, authorized its use on diplomas, where it remained for many years.

The Devreese design was considered the official seal until the 1960s, when there were calls to update it. In 1969, with Harold Brown's inauguration as president and the imminent admission of female undergraduates, Caltech's administration looked at two "new and improved" renderings. Apparently, they couldn't decide which one to use: both versions appeared on Brown's inauguration publications.

Brown thought the original Devreese seal didn't help Caltech's public image or its fund-raising efforts. He solicited the opinion of trustee Henry Dreyfuss, a well-known industrial designer, on a possible revamp. Dreyfuss promptly submitted his own hand-drawn sketch, just after Caltech started admitting undergraduate women. Above it, he wrote, "Instead of boys chasing one another, we have a boy chasing a girl, or vice versa." In a memo to an intermediary, Brown wrote "I like this seal."

Meanwhile, with surprisingly little discussion, the trustees officially adopted a design consisting

of a torch held by a single hand. Members of the student body, however, took exception, and suddenly everyone on campus had an opinion. To complicate matters further, when Caltech trustees started delving into the Devreese seal's actual history, it was discovered that it had never been officially approved by anyone in a position to do so. It had merely served as the de facto official seal for those many decades.

There matters rested until 1984, when the issue of the Institute seal resurfaced. Caltech's trustees rescinded the board's 1969 approval of the one-handed seal. The Devreese design was adopted as the official seal retroactively to 1925 but was taken out of circulation except for its use on diplomas, while the motif Millikan originally favored of a torch being passed—with just the hands this time—went into general usage on all campus publications, souvenirs, and memorabilia. In the early 2000s it supplanted the Devreese seal on the diplomas as well.

What I can tell you, as one of Caltech's storytellers, holds true for others who have, and will, in the future, depict this little school in Pasadena with its outsized ambition and aspirations. Without exception, their works will reflect the perspectives, agendas, and quirks of their creators. Mine included. We all come to our task, to our tales, and to our art, with a point of view. That said, all of what I have written here comes directly out of the Archives, Caltech's memory vault. It's only a sample of what lies there still, waiting to be explored.[3]

1—Dino Cinti, *Biblioteca Galileiana: Raccolta dal Principe Giampaolo Rocco di Torrepadula* (Florence: Sansoni, 1958). Issued in a limited edition of 666 numbered copies, the Cinti bibliography opens with an essay describing the history of astronomy from antiquity to the time of Galileo. This is followed by a chronological listing of the individual works collected by Prince Rocco, including many black and white images of the texts.

2—The Rocco and Watson first editions I describe were all published in Latin, with the exception of Galileo's *Dialogue*, which was originally written in Italian. With one or two exceptions, their titles are translated here into English.

3—Portions of this work appeared in somewhat different form in *Caltech News* (1992), *Caltech 336* (2001), and "Earnest Watson and the Amazing Liquid Air Show," in the Earnest C. Watson Caltech Lecture Series, October 29, 1997. I would like to thank Heidi Aspaturian and Elisa Piccio of the Caltech Archives; Loma Karklins, now retired from the Caltech Archives; and Caltech registrar Christy Salinas for their help in preparing this preface.