The first edition of Galileo Galilei’s *Istoria e dimostrazioni intorno alle macchie solari* [*History and Demonstrations Concerning Sunspots and Their Properties*] (Rome: G. Mascardi, 1613)

Christopher Scheiner’s *Rosa Ursina* (Bracciano: A. Phaeum, 1626-30)

Galileo’s *Istoria* is a response to *Rosa Ursina* by the Jesuit priest Christopher Scheiner, who claimed that sunspots were satellites orbiting the sun, casting shadows as they passed in front of it. Galileo, one of the earliest observers of sunspots, refuted Scheiner’s arguments and rightly asserted that the spots were on or near the surface of the sun. Scheiner devoted the entire first book of *Rosa Ursina* to attacking Galileo, whom he believed had accused him of plagiarism.

In this work, Galileo compares the Ptolemaic, or geocentric, system with the Copernican, or heliocentric, system through a dialogue among three characters. One speaker, representing Galileo’s viewpoint, uses the ebb and flow of the tides and the movement of sunspots as empirical evidence in support of the Copernican system, and his traditionalist opponent is unable to refute his claims. This work was lawfully published in 1632, but the following year Galileo was convicted of suspicion of heresy for favoring the Copernican system.

Galileo was forced to publish this book on the two new sciences of mechanics and motion in the Netherlands because of the Inquisition.
It is the last book he published and is in the form of a dialogue between the same three interlocutors in the *Dialogue Concerning the Two Chief World Systems*.

2

The first edition of Isaac Newton’s *Philosophiae naturalis principia mathematica* (London: J. Streater, 1687)

Isaac Newton set forth his theory of universal gravity and the three laws of motion in this work (commonly referred to as the *Principia*). It is considered to be the foundation stone of classical mechanics, which dominated the physical sciences until the development of quantum mechanics in the early twentieth century. This copy contains significant annotations, some written on pasted-in attachments, by a contemporary reader with considerable mathematical knowledge.

16

The first edition of Nicolaus Copernicus’s *De Revolutionibus orbium coelestium* (Nuremburg: Petraeus, 1543)

*On the Revolution of Heavenly Bodies*, published while the Polish astronomer Copernicus was on his deathbed, was the first work to set forth the theory of heliocentrism (a sun-centered solar system). His bold claims undermined the Ptolemaic geocentric (Earth-centered) system, which had been widely accepted for over two thousand years. *De Revolutionibus* still adhered to certain conventional views that were later disproved. For example, Copernicus maintained that the orbits of the six planets were perfectly spherical and that an outer sphere of distant stars in fixed positions surrounded the sphere of Saturn. Despite its imperfections, Copernicus’s landmark work helped spark the scientific revolution. The Ransom Center holds two of the 277 copies of the first edition that survive.

18

The first edition of Simon Marius’s *Mundus iovialis* (Nuremburg: Lauer, 1614)
Simon Marius claimed to have discovered the moons of Jupiter several days before Galileo Galilei. Though it is not possible to refute his claims definitely, there is little evidence to support them. Regardless, it is the names that Marius gave the moons—Io, Europa, Ganymede, and Callisto—that we use today, not the “Medicean stars,” as Galileo wanted.

20

The first edition of James Nasmyth and James Carpenter’s *The Moon: Considered as a Planet, a World, and a Satellite* (London: John Murray, 1874)

Nasmyth and Carpenter’s imaginative presentation of what might be seen by a “lunar being” was one of the first of its kind. The authors built plaster models of the lunar surface and attempted to recreate lunar lighting conditions for their photographs. They espoused some theories that have since been debunked—for example, that mountains on the moon’s surface were volcanoes that erupted dust.

32

The first edition of Johannes Kepler’s *Harmonices mundi* (Linz: G. Tampachius, 1619)

The Latin title translates literally as “The Harmonies of the World.” This title aptly describes the books contents, which range from musical harmonies to astrological harmonies over five long chapters. The final chapter, on the harmony of planetary motion, sets forth Kepler’s third law of motion. This law complements the two he discovered in *Astronomia Nova* (1609). Kepler’s laws of motion were influential in Newton’s development of the law of universal gravitation in the *Principia*.

36

The first edition of Johann Doppelmayr’s *Atlas coelestis* (Nuremberg: Homann, 1742)
Doppelmayr was a German mathematician, physicist, and astronomer who prepared several book relating to astronomical phenomena. His best-known book is this one, celebrated for its magnificent hand-colored plates of the solar system and the constellations.

54

The first edition of Johannes Kepler’s *Tabulae rudolphinae* (Ulm: J. Saurius, 1627)

The tables in this volume were the most accurate calculations of the time for determining star and planetary positions. The data for the tables came in large part from the observations of Tycho Brahe, passed on to Kepler after Tycho’s death.

56

The first edition of Johannes Kepler’s *Astronomia nova* (Heidelberg: E. Voegelinus, 1609)

Kepler relied on the observational data of Tycho Brahe to mathematically prove Copernicus’s heliocentric system. In addition, he dispelled some of Copernicus’s outmoded ideas, showing that planetary orbits must be elliptical rather than circular. He puts forth his first two laws of planetary motion: that planets move in elliptical orbits and that they speed up as they approach the sun. 2009 marks the 400th anniversary of this landmark publication in mathematical astronomy.

60

The first edition of Tycho Brahe’s *Epistolarum astronomicae* (Uraniborg, 1596)

This copy of letters exchanged between Tycho and the Landgrave of Hesse regarding the Uraniborg Castle observatory on the island of
Hven belonged to Anton Fugger, a member of the famous merchant family of Northern Germany.

61

The first edition of Tycho Brahe’s *Astronomiae instauratae mechanica* (Nuremberg: Hulsium, 1602)

Tycho Brahe’s penchant for scientific precision led him to craft astronomical instruments on his island institute Uraniborg. This book details the uses of many of the homemade instruments that allowed him to measure star and planetary positions with accuracy up to one arc minute.

14

The first edition of Johannes Hevelius’ *Selenographia: sive lunae descriptio* (Gdansk: Hünefeldianis, 1647)

The first complete lunar atlas is based on four years of research conducted by Hevelius in his home observatory using self-built instruments. Hevelius also executed the book’s 110 engravings, including the volvelle, a movable printed paper circle surrounded by fixed, printed information allowing for the calculation of astronomical data, shown here.

19


The first edition of the English astronomer’s John Flamsteed’s atlas was published posthumously and to wide acclaim in 1729. It surpassed previous atlases in accuracy and completeness, if not beauty. Jean Fortin, globe maker for the French royal family, was commissioned to produce this corrected and expanded edition, which consists of 30 plates, plus a star catalog. Shown here is Taureau (Taurus).

Godwin’s fictional narrative is regarded by many as the first English language work of science fiction. In it, Domingo Gonsales recounts his journey, via a geese-powered flying apparatus, to the moon, where the peaceful race of moon men grow to heights between 10 and 30 feet, live beyond 1000 years, dress in clothes colored in hues not known on Earth, and travel about easily with the aid of feathered fans. As in many works of the genre, the story serves as a critique of humanity’s failings.

John Wilkins’s *Discovery of a World in the Moone, or, a Discourse Tending to Prove that ‘tis Probable There May Be Another Habitable World in That Planet* (London: Sparke and Forrest, 1638)

Wilkins’ book is decidedly not a work of science fiction but a set of propositions—the first being that “the stranegenesse of this opinion is no sufficient reason why it should be rejected”—inspired by and following from the work of Kepler and Galileo’s telescopic discoveries. Wilkins’ propositions liken the moon to Earth. He argues that areas of light and dark are evidence of sea and land and observes that the moon has mountains, valleys, plains, and an atmosphere. Based on these similarities, he concludes “tis probable there may be inhabitants in this other World, but of what kinde they are is uncertaine.” Wilkins would later help found and serve as first secretary of the Royal Society in 1660.

Marcus Manilius’s *Astronomicon* (Paris: F. Leonard, 1679)

Little is known of the ancient Roman poet Marcus Manilius outside of what is contained in his didactic astronomical poem, written circa
the 1st century BCE. It is apparent, however, that the poet was engaged with the most progressive astronomical thought of his era. The poem is so learned that the bulk of this volume consists of interpretations of and annotations to Manilius’ verses.

28

Aristarchus of Samoa’s *De Magnitudinibus, et distantiiis solis, et lunae* (Pesaro, Italy: C. Francischinum, 1622)

This is the only extant work by Alexandrian mathematician Aristarchus of Samoa (ca. 217-145 BCE). In it, Aristarchus uses deductive mathematics to posit relative sizes of the Sun and the Moon, as well as their distances from Earth. Although *De Magnitudinibus* reflects a geocentric model, Archimedes cites Aristarchus as a very early proponent of the heliocentric model, which he outlined in a now-lost work.

30

Pierre Gassendi’s *Institutio astronomica* (London: J. Flesher, 1653)

Following Gassendi’s work in this book is a reprinting of *Sidereus Nuncius* (1610), Galileo’s famous treatise containing his telescopic observations. The woodcuts of the moon, shown here, illustrate Galileo’s observation that its surface was pitted and mountainous rather than smooth.

34

Aristotle’s *Aristotelous physikes akroaseos* . . . (Paris: G. Morelium, 1561)

An early printing in Greek of a selection of Aristotle’s 3rd century BCE works. Shown here is the first page of *De Caelo (On the Heavens)*, in which Aristotle posits that the heavens, eternal and perfect, are composed of a non-degrading aether, while bodies in the region spanning the Earth to the Moon consist of the four classical elements: earth, water, fire, and air, which are perishable.
42

Lantern slide of a solar eclipse by John Spiller, 1868

John Spiller captured this image with the aid of a telescope. Lantern slides, introduced in the United States around 1850 and popular through World War I, are photographic images on glass. A slide would be placed in a lantern slide projector or “magic lantern,” to be viewed on a wall or screen.

44

Howard Grubb’s photograph of the moon, 1868
Albumen print

Howard Grubb, designer and maker of telescopes, took this photograph through the “Great Melbourne Telescope” at the Melbourne observatory in Australia. The telescope was designed by and built under the direction of his father, Thomas Grubb.

51

Michael Light’s “Full Moon: Composite of Harrison Schmitt at Shorty Crater, 1999”
Composite image

The image depicts the geologist Harrison Schmitt and the lunar rover near the rim of 360-foot-wide Shorty Crater, the site at which Schmitt discovered an unusual orange soil, which can be seen here in subtle patches. Light created this image based on original transparencies by astronaut Eugene Cernan during the mission of Apollo 17, December 7-19, 1972.

55

Ptolemy’s *Almagestum* (Cologne: P. Liechtenstein, 1515)
This 1515 printing of the *Almagest*, originally written by Ptolemy in the 2nd century, represents the first complete publication of the most important source of information on ancient Greek astronomy. Ptolemy’s geocentric model served as the foundation of astronomy in the Middle Ages until the publication of Copernicus’ *De Revolutionibus* in 1543, and this edition may be the one consulted by that astronomer. The chart shown here pertains to solar and lunar eclipses.

Bernard le Bovier de Fontenelle’s *A Plurality of Worlds* (London: T. Osbourne, 1702)

With *Entretiens sur la pluralité des mondes*, Fontenelle made accessible to the general educated public the systems of Ptolemy, Copernicus, and Tycho. Written in a popular dialog form, the work stimulated interest in astronomy in non-scientific circles and helped to popularize the scientific method. The folded plate depicts the five planets visible to the naked eye in their relation to Earth.

58 NOTE: this item not in show; label goes next to big blowup on fire extinguisher gallery wall!

Reproduction of a plate from Thomas Wright’s *Clavis Coelestis: Being the Explication of a Diagram Entitled a Synopsis of the Universe; or, The Visible World Epitomized* (1742)

First American edition of Jules Verne’s *From the Earth to the Moon, Direct in Ninety-Seven Hours and Twenty Minutes: and a Trip Round it* (New York: Charles Scribner, 1874)

Verne’s science fiction novel and its sequel tell how the members of the Baltimore Gun Club conceive and execute a plan to travel to the moon in a rocket launched from a gigantic cannon. Verne is perhaps better known for his novel of oceanic travel *Twenty Thousand Leagues Under the Sea*. 
Johann Bayer’s *Uranometria* (Ulm: J. Gorlini, 1661)

Originally published in 1603, Bayer’s star atlas was the first to cover the entire celestial sphere. The atlas uses what is now known as “Bayer designation” to unambiguously identify each star in a constellation by one Greek (and sometimes, Latin) character, followed by the genitive form of the constellation’s name (for example, Alpha Centauri). Bayer’s system is still used for most of the visible stars. Shown here is an engraving of Sagittarius.

Abraham bar Hiyyā ha-Nasi’s *Surath Ha-Ares* (*The Form of the Earth*) (Italian manuscript, circa 15th century)

Bar Hiyyā (1070-1136) was a key figure in the transmission of Muslim science to the Christian West. Shown here is a late fourteenth or early fifteenth-century Hebrew manuscript on vellum of Bar Hiyyā’s twelfth-century scientific treatise on astronomy and cosmography. It is thought to be the first scientific treatise written in Hebrew on the topic.

Caroline Herschel’s *An Account of a New Comet. Read at the Royal Society, Nov. 9, 1786*. (London: J. Nichols, 1787)

Caroline Herschel is credited with the discovery of eight new comets. Her brother William trained her in astronomical observation, for which she had a natural gift. On this occasion, William was away during her discovery, so she transmitted the report of a new comet to the Royal Society herself. Later, William made several reports to the Society on the path of the same comet. The tone of her report strikes us today as self-effacing given the extent of her personal accomplishments.
Caroline Herschel’s Memorandum book of astronomical observations, dates unknown
Herschel Collection

This marbled covered records book was kept by Caroline Herschel and contains her conversations with her brother William at the breakfast table. The manuscript was presented by Caroline to her nephew John and became a treasured family memento. One of Caroline’s great nieces has commented on her “wonderful perseverance & neatness of work” in an accompanying note.


Herschel became fascinated by “deep sky” objects such as nebulae (in his day, this term referred to complex astronomical formations such as galaxies and other interstellar objects, not to interstellar clouds of gas) and double stars after encountering Messier’s object catalog in the 1780s. He became immersed in cataloging around 2,500 of these stars and refining earlier observations, including those of the English astronomer John Flamsteed. In the next century his son John would make further refinements and publish his own, even larger, star catalog.

Herschel Collection

Herschel would rotate his large reflector telescopes (the largest of which was forty feet long) to a particular part of the sky and then keep the instrument in a fixed position, allowing the sky to move
across his field of vision. The size of the telescope required him to climb a long ladder to reach the eyepiece, and he would have Caroline, who was positioned below, record the data. These observations allowed Herschel to obtain a better sense of the relative size and shape of the Milky Way galaxy (illustrated here).

Wall

First edition of Giovanni Domenico Cassini’s map of the moon, 1679

This is the rarest edition of the first published map of the lunar landscape, reflecting the latest telescopic observations made of craters, mountains, and other features. If you look very carefully at the edge of one of the craters, you will discover a “moon maiden,” probably a playful addition by Cassini or his engraver.

71

Caroline Herschel’s manuscript notebook containing star conversion charts, 1783-1789
Herschel Collection

These charts were intended to facilitate calculations of astronomical positions by factoring in the day of the year. At this time, Caroline was assisting her brother with a search for new comets. After Herschel’s celebrated discovery of Uranus in 1781, he enjoyed wide public recognition and a considerable salary as the “King’s Astronomer.”

38

John F. W. Herschel’s notes and drawings of Halley’s Comet, January 25-27, 1836
Herschel Collection

These are hastily drawn attempts to capture the appearance of the famous comet, which first became visible at the Herschel observatory.
(Feldhausen) in October 1835 and was viewable for seven months. Herschel and his colleagues also used the nearby Royal Observatory at the Cape to make observations.

41

John F. W. Herschel’s instructions on building a telescope Herschel Collection

As Herschel’s fame grew, he advised scientists and foreign governments on the construction of large Newtonian reflector telescopes based on his own design. Such telescopes used a secondary mirror to reflect the magnified image upward into an eyepiece but also introduced various forms of optical distortion. These are no longer used by professional astronomers.

39

John F. W. Herschel’s sketch of the twenty-foot reflector telescope at Capetown (Cape of Good Hope) Herschel Collection

Between 1834 and 1838, Herschel ran an observatory at Capetown, South Africa, which allowed him to peer deeply into the heavens. The principal feature was a large twenty-foot-long reflector telescope. As a result of the Capetown observations, he was able to complete his important catalog of double stars and nebulae.

33

John F. W. Herschel’s Results of Astronomical Observations Made during the Years 1834, 5, 6, 7, 8, at the Cape of Good Hope. (London: Smith, Elder, 1847)

Herschel’s Capetown observatory years provided him with a wealth of data to be digested upon his return to London in 1838. He waited nearly a decade to collect and publish many of his results. Some of the most important are the rediscovery of the inner moons of Saturn—not seen by anyone since his father had discovered them
many years before—observations of sunspots, and the Magellanic Clouds, a prominent feature of the Southern Hemisphere’s sky.

John F. W. Herschel’s drawing of the movement of sunspots, February 13, 1837
Herschel Collection

Herschel made significant contributions to the study of the sun by carefully observing the motion of sunspots across the sun’s face. He identified prevailing “winds” which appeared to control their motion. The forces behind the movement of sunspots are still a matter for dispute, although changes in the orientation of the sun’s magnetic field are certainly involved.

William Herschel’s astronomical scroll calculator, date unknown

When astronomers locate the position of objects in the sky they use a system of consistent sky coordinates based on right ascension (the equivalent of longitude on the earth) and distance from the pole. Astronomers must use this scheme of reference so that other observers around the world may be able to locate the same object. This homemade calculator may have been used by Herschel and his sister Caroline in the compilation of his catalog of double stars and nebulae, since many repetitive calculations would have been required. Today, the computer serves the same function.

Caroline Herschel
Four illustrations of Halley’s Comet, 1835-36 (this wall)
Six illustrations of comets, including Cassini’s, Biela’s, and Donati’s, dates unknown (side wall)
Gouache on paper
Herschel Collection
At the time of her observations of Halley’s Comet in 1835-36, Caroline Herschel was in her late eighties and had already received many honors, including a gold medal and honorary membership from the Royal Astronomical Society. Since photography was still in its infancy, it was only possible to capture the appearance of astronomical events using artistic means.

Halley’s Comet, which reappears every 75 (or so) years and is called a periodic comet, can be seen with the naked eye and has fascinated celestial observers since antiquity. Both John F. W. Herschel (at his observatory at Capetown) and his aunt Caroline (who had returned to her home in Hanover, Germany) made detailed observations of the comet. John’s pencil sketches are in one of the cases.

Brass telescope, early 20th century
Loan from Peridier Library, Department of Astronomy

This instrument would have been used by serious amateur astronomers or for teaching purposes and would have cost as much as an automobile did in 1920 (around $500).

Vincenzo Coronelli’s celestial globe, late 17th century
Kraus Map Collection

The Ransom Center is one of the few libraries in the world to own a pair of Coronelli’s large celestial and terrestrial globes (the terrestrial globe, not displayed here, is dated 1688). Only a handful of the constellations, labeled in Latin and Italian, have been included. The scale and the quality of the engraving make this one of the finest examples of the mapmaker’s art. The Center also owns a bound set of Coronelli’s printed gores (the segments of the globe which are pasted onto a wooden sphere), and reproductions of these are displayed on one of the gallery walls.
Julia Margaret Cameron
Portrait of John F. W. Herschel, 1867
Albumen silver print
Gernsheim Collection

Cameron is known for her carefully posed portraits of Victorian notables, including Alfred, Lord Tennyson. Herschel himself made significant contributions to the emerging science of photography, and he and Cameron corresponded frequently about technical matters. Cameron’s portrait reveals the subject’s intelligence, eccentricity, and his need for a good hairstylist.

76

Reproduction of Joseph Brown’s portrait of Caroline Herschel, ca. 1842

77

Edward Scriven, engraved portrait, after John Russell, of William Herschel, undated

Note the misspelling of the subject’s name.

75 (framed on wall)

Photographs of the construction of the McDonald Observatory telescope, 1938

Memorabilia from the dedication of the Hobby-Eberly Telescope, 1997

The McDonald Observatory, originally owned by the University of Chicago and later transferred to The University of Texas at Austin,
was constructed in the Davis Mountains of West Texas in the late 1930s. The largest telescope currently at the Observatory is the Hobby-Eberly Telescope, the fourth largest instrument of its kind. It was named for former Texas Lieutenant Governor Bill Hobby and for Robert E. Eberly, a donor to Pennsylvania State University.