Adriaan Metius
Dutch, 1570-1635
Institutiones astronomicae & geographicae: fondamentale ende grondelijcke onderwysinghe van de sterrekonst, ende beschryvinghe der aerden, door het ghebruyck van de hemelsche ende aerdtsche globen (Instruction in Astronomy and Geography: Fundamental and Thorough Instruction in Astronomy, and Description of the Earth, through the Use of Celestial and Terrestrial Globes)
Published by Willem Iansz, Amsterdam, 1621 (2nd edition)
From the collection of the James Ford Bell Library, University of Minnesota

Vermeer scholar James Welu managed to identify the open book in The Astronomer as the second edition of Adriaan Metius's guide to astronomy and geography. Close inspection reveals the illustration on the page to be the cartwheel astrolabe, a Metius invention. This spot in the book is Chapter Three, entitled "On the Investigation or Observation of Stars." Metius noted here that the first star watchers were the patriarchs, remarking "how careful the patriarchs were so that the wisdom and knowledge about astronomy would not be lost from human thought." This may have inspired Vermeer to choose the finding of Moses as the theme for the picture on the back wall.

As a mathematics professor, astronomer, cartographer, and engineer, Metius wrote extensively on astronomical instruments. Yet he intended this volume for a general audience, writing that it would be "useful for sailors and navigators as well as entertaining for amateurs."

Galileo Galilei
Italian (Tuscan) 1564-1642
Dialogo . . . di due massimi sistemi del mondo (Dialogue Concerning the Two Chief Systems of the World)
Frontispiece etched by Stefano Della Bella, Italian (Florentine), 1610-1664
Published by Giovanni Battista Landini, Florence, 1632

From the collection of the James Ford Bell Library, University of Minnesota
It has been 400 years since Galileo first pointed his telescope to the sky. From his rooftop apartment in Florence, he made startling discoveries: the four moons of Jupiter, the imperfect, cratered surface of the Moon, the phases of Venus. This last observation presented some of the first incontrovertible evidence that the planets did not orbit the Earth but instead revolved around the Sun. In 1616, the Church declared the idea of a Sun-centered universe-a theory first formulated by Copernicus in 1543-to be heresy.

Galileo's book, a well-articulated defense of the Copernican system, was published in 1632, but was banned by the Church until 1835. Stefano Della Bella's frontispiece shows Aristotle, Ptolemy, and Copernicus engaged in a lively debate. Their viewpoints are cleverly explicated in the text in the form of a dialogue between three contemporary men: Simplicio, a simpleton who believes in a geocentric universe, Salviati, an intelligent follower of Copernicus, and Sagredo, a neutral aristocrat. In Dialogo Galileo unwisely

insulted Pope Urban VIII, who was initially somewhat sympathetic to Galileo but felt parodied by some of Simplicio's comments. The book landed Galileo before the Inquisition, and although he recanted his beliefs at the trial, he was sentenced to life imprisonment. His term was later commuted to permanent house arrest.

Pierre Gassendi
French, 1592-1655
Institutio astronomica, juxta hypotheses tam veterum quàm recentiorum cui accesserunt Galileo Galilei Nuntius Sidereus, et Johannis Kepleri Dioptrice (Astronomical Instruction According to the Hypotheses from Antiquity to Recent Times, Including Galileo Galilei's "Starry Messenger" and Johannes Kepler's "Dioptrics")
Published by Jacob Flesher, London, 1653
From the collection of the James Ford Bell Library, University of Minnesota

Galileo published his first telescopic discoveries in 1610 in his small but influential book Starry Messenger. He illustrated some of his most sensational observations, like the rough, uneven surface of the Moon. The drawings were astonishing: previously, the Moon was thought to be a smooth, pure sphere that was part of the immutable heavenly body-not corrupt and imperfect like Earth.

The first edition of Galileo's book sold out quickly. Plans for a second printing were never realized, perhaps due to his troubles with the Inquisition. The copy here appeared in a guide published by Pierre Gassendi. A French philosopher and astronomy enthusiast, Gassendi included not only Galileo's book but also Johannes Kepler's treatise on telescopic optics, originally published a year after Starry Messenger in response to Galileo's ground-breaking findings.

Vincenzo Coronelli
Italian (Venetian), 1650-1718
System of the Universe According to Copernicus
Etching and engraving
From the Epitome cosmografica (Abridged Cosmography)Published by Andrea Poletti, Cologne, 1693
From the collection of the James Ford Bell Library, University of Minnesota

Vincenzo Coronelli was a Franciscan friar and talented cartographer, serving as the official mapmaker for Louis XIV and the city of Venice. His strength was charting the heavens. Among his celestial maps and cosmological charts is this Copernican model of a heliocentric universe. In fact, Coronelli devoted considerable space in Epitome Cosmografica to diagramming Copernicus's theories about the Earth's movement. Given the author's religious affiliation, this would seem to indicate that by 1693, despite the Church's official stance against it, the heliocentric concept was gaining ground.

Flanders
Verdure with Parrot, about 1700
Wool, silk; tapestry weave
Anonymous loan X2004.3

We often forget that tapestries could be far more expensive than paintings. Coveted for their warmth, splendor, and dazzling demonstration of skill, these luxury items decorated walls, floors, and furniture in the townhouses of wealthy burghers. A related trend was the popularity of table carpets, a common fixture in 17th century Dutch paintings, including The Astronomer. These carpets were often woven with simple foliate designs similar to the one in this wall panel.

Vermeer's hometown of Delft had a prosperous tapestry trade, but this example was more likely produced in the Southern Netherlands, or Flanders, the leading center of European tapestry production since the late 15th century.

Japan, Meiji period
Robe, about 1900
Silk with silk or cotton padding

In 1639 the shogun expelled the Portuguese from Japan, thus giving the Dutch exclusive trading privileges with the island country. The Dutch East India Company supplied collectors in Europe with vast quantities of exotic goods from Japan, including ceramics, objet d'art, and textiles. Japanese tanzen, lightly padded robes worn by men during the cold winter months, became popular among fashionable Dutch gentlemen-and eventually women-during Vermeer's time. Generically called Japanse rok (Japanese robes) by the Dutch, these luxurious garments were sought after for their warmth, comfort and elegance, and as a way for their owners to express their worldly sophistication and wealth. Finely striped or checked patterns, as seen on this example, became popular in the late 19th century.

Michael Wolgemut
German, 1434-1519
Wilhelm Pleydenwurff
German, about 1460-1494
The Fourth Day of Creation, 1493
Woodcut
From Hartmann Schedel's Liber Chronicarum (Nuremberg Chronicle)Published by Anton Koberger, Nuremberg, 1493
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,653

This print comes from the celebrated Nuremberg Chronicle, an illustrated early history of the world. Ambitious in scale, it contains more than 1,000 woodcuts depicting key events from Creation to the time of its publication. This sheet presents the fourth day of

Creation, when God said, “Let there be lights in the firmament of the heavens to separate the day from the night.” The stars and planets appear in perfectly circular orbits around the stationary Earth.

Michael Wolgemut
German, 1434-1519
Wilhelm Pleydenwurff
German, about 1460-1494
The Seventh Day of Creation, 1493
Woodcut
From Hartmann Schedel’s Liber Chronicarum (Nuremberg Chronicle)Published by Anton Koberger, Nuremberg, 1493
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,654

The Bible tells us that on the seventh day, God rested. Here he appears enthroned above the universe, amid a choir of angels. The overall conception of the universe is largely rooted in Aristotle’s world system. The Earth is depicted in the center, surrounded by three rings embodying the elements of water, air, and fire. The next seven rings represent the seven planets, which move in circular orbits around the Earth, including the Moon and the Sun. Successive rings represent the constellations of the zodiac, the crystalline heavens, and the Prime Mover, which Aristotle credited with keeping the heavens in motion.

Andreas Cellarius
German (active in the Netherlands), about 1596-1665
The Planisphere of Ptolemy, 1660
Hand-colored engraving
Plate 1 from Harmonia MacrocosmicaPublished by Gerard Valk and Peter Schenk, Amsterdam, 1708 edition
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,542

Ptolemy’s towering treatise the Almagest, dating from about 150 a.d., was the authoritative textbook on astronomy for nearly 1,500 years. Arabic scholars and then mediaeval monks copied the Latin text in illuminated manuscripts before the age of print. Here the cartographer Andreas Cellarius described Ptolemy’s geocentric conception of the universe. In the lower margins, the artist included imagined portraits of Ptolemy (lower right), and Aristotle (lower left), the chief source of Ptolemy’s ideas.

Nicolas de Fer
French, 1646-1720
The Artificial or Oblique Armillary Sphere, 1740
Hand-colored engravingEngraved by P. Starckmann
Gift of Harlan D. Boss P.90.27.163

Ancient astronomers used the armillary sphere to measure the coordinates of stars. By the 17th century, the tool was regarded as too imprecise for scientists, but it found new life in the well-appointed libraries of rich burghers, where it became a chic curiosity and emblem of sophistication. This example shows the traditional model, with the Earth at the center of the universe. The graduated rings represent the primary celestial sphere, which includes the 12 constellations of the zodiac, the celestial equator, the meridian, and the latitude lines of the Earth projected into the sky.

This complicated engraving also depicts four competing interpretations of the cosmos-those of Ptolemy, Copernicus, Tycho Brahe, and Descartes-as well as the uneven surface of the Moon (note the mountains and deep craters), first observed by Galileo in 1609.

Andreas Cellarius
German (active in the Netherlands), about 1596-1665
The Planisphere of [Tycho] Brahe, 1660
Hand-colored engraving
Plate 6 from Harmonia Macrocosmica Published by Johannes Janssonius, Amsterdam, 1660
Gift of Harlan Boss P.90.27.32

The Danish astronomer Tycho Brahe (1546-1601) devised this complex geo-heliocentric model, which has the Sun and Moon revolving around the Earth, and the other planets orbiting the Sun. This reflected a compromise between the systems of Ptolemy and Copernicus by permitting the Earth to remain immobile at the center of the universe but accounting for some of the newly recorded observations on how the planets moved. Despite its problems (namely the intersecting orbits of Mars and the Sun), Tycho's hybrid system was favored during most of the 17th century.

Tycho operated one of Europe's most advanced observatories, called Uraniborg, built on the island of Hven with the support of the Danish crown. His advanced astronomical instruments and tireless observation-he accurately measured and catalogued the position of more than 1,000 stars-helped elevate the field of astronomy to the level of serious science.

Andreas Cellarius
German (active in the Netherlands), about 1596-1665
The Varying Phases and Appearances of the Moon, 1660
Hand-colored engraving
Plate 19 from Harmonia MacrocosmicaPublished by Gerard Valk and Peter Schenk, Amsterdam, 1708
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,544

Albrecht Dürer
German, 1471-1528
The Northern Hemisphere of the Celestial Globe, 1515 (probably printed in 17th century)
Woodcut
Gift of Richard H. Zinser P.12,787

Albrecht Dürer's renowned celestial maps of the northern and southern hemisphere were the first star charts ever to be printed. The 48 classical constellations-the twelve signs of the zodiac, Orion, the Great Bear, and so on-that make of up core of these charts were carefully catalogued by Ptolemy in his Almagest. There were a number of drawn precedents of celestial maps found in Arabic and European illuminated manuscripts, and Dürer's designs, in fact, rely heavily on two drawn on vellum in Nuremberg, his hometown. Yet he updated the positions of the stars to show their locations around 1500, working closely with Nuremberg mathematician Conrand Heinfogel and the imperial astronomer Johann Stabius, who commissioned these woodcuts. A century of celestial globe makers took their information from these pioneering star charts, including Gerard Mercator whose 1551 globe is coming on loan from the Adler Planetarium (beginning October 15).

Albrecht Dürer
German, 1471-1528
The Southern Hemisphere of the Celestial Globe, 1515 (probably printed in 17th century)
Woodcut
Gift of Richard H. Zinser P.12,788

The southern sky was largely uncharted until the 16th and 17th centuries when Italian and Dutch explorers began sailing the southern seas. This woodcut, published on the eve of this age of exploration, records the basic state of knowledge in 1515, which was rather spare. Uncharted skies presented great challenges to navigators, since they needed accurate star maps to determine their longitude at sea. Exploration prompted a great push on the part of sailors, merchants, and publishers, particularly in Holland, to map the unknown skies.

Andreas Cellarius
German (active in the Netherlands), about 1596-1665
The Southern Stellar Hemisphere of Antiquity, 1660
Hand-colored engraving
Plate 27 from the Harmonia Macrocosmica, 1708Published by Gerard Valk and Peter Schenk, Amsterdam
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,550

Although the title places this sky chart in antiquity, Andreas Cellarius in fact included a number of recently identified stars. Some 17 new constellations appear here-including the Southern Triangle, the Peacock, the American Indian, and the Toucan-that were not

described by Ptolemy. Most of the new southern stars were first published in 1612 by the Dutch cartographer and theologian Petrus Plancius, who had supplied astronomical instruments to a navigator with the Dutch East India Company.

Andreas Cellarius
German (active in the Netherlands), about 1596-1665
Scenographic View of the Southern Hemisphere with the Starry Vault and the Earth, 1660
Hand-colored engraving
Plate 28 from Harmonia Macrocosmica, 1708
Published by Gerard Valk and Peter Schenk, Amsterdam
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,551

Andreas Cellarius first published his elaborately illustrated celestial atlas Harmonia Macrocosmica in 1660. Although the book presented little new science, it was a spectacular artistic achievement. The cosmographer presented the history of the cosmos in extraordinary splendor, embellishing his monumental engravings with forceful figurations of the constellations, charming margin decorations, and hand-coloring.

This plate shows the innovative perspectival view Cellarius developed to represent the constellations, inventively showing the terrestrial globe within the transparent celestial sphere. This scenographic view, as Cellarius called it, made it easier for the viewer to visualize the position of the stars overhead. The southern tip of South America and Africa are visible as well as a speculated landmass at the South Pole, much larger than Antarctica, called “Terra Australis Incognita” or unknown southern land. This map also incorporates the discoveries of the explorers of the previous century, namely newly identified stars in the southern sky.

Andreas Cellarius
German (active in the Netherlands), about 1596-1665
Spherical Scenograph of the Celestial and Terrestrial Northern Hemispheres, 1660
Hand-colored engraving
Plate 25 from Harmonia Macrocosmica, 1708Published by Gerard Valk and Peter Schenk, Amsterdam
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,548

This pioneering illustration of the northern hemisphere, with the terrestrial and celestial globes shown together, provides an interesting snapshot of Dutch attitudes towards exploration (and colonization). The Japanese island of Urup, for instance, which is just below the elbow of “Bootes,” the club-wielding herdsman shown wearing a pink coat, is labeled “Compagnies Lant.” This is Dutch for “Company Land” and references how the Dutch East India Company had taken possession of the island after a 1643 expedition there. The costuming of the constellation “Bootes” is also noteworthy. Shown as a heroic

nude in Dürer's woodcut, "Bootes" is depicted here in northern attire, wearing a fur hat, long coat, and warm boots.

Julius Schiller
German, died 1627
Saint Stephen (Cepheus), 1627
Hand-colored engraving
Constellation 4 from Coelum Stellatum Christianum (Christian Starry Heavens)Published by Andreas Aperger, Augsburg, 1627Engraved by Lucas Kilian after Mathias Kager
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,664

Intent on Christianizing the pagan sky, a Catholic lawyer, Julius Schiller, dedicated himself to recasting the constellations in terms of the bible. The result is the charming 1627 atlas Coelum Stellatum Christianum. In this print, the constellation Cepheus, the mythological King of Ethiopia (husband of Cassiopeia and father of Andromeda) is transformed into Saint Stephen. Although Schiller failed to replace the classical narratives associated with the constellations, many subsequent atlases, such as Andreas Cellarius's celebrated Harmonia Macrocosmica, included his Christian star charts (one exhibited nearby).

Andreas Cellarius
German (active in the Netherlands), about 1596-1665
Christian Constellation, Second Hemisphere, 1660
Hand-colored engraving
Plate 23 from Harmonia Macrocosmica, 1708Published by Gerard Valk and Peter Schenk, Amsterdam
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,546

Rembrandt van Rijn
Dutch, 1606-1669
Faust (The Scholar in His Study), about 1652
Etching, drypoint, and burin
The William M. Ladd Collection, gift of Herschel V. Jones P.1,321

The close connection of Vermeer's Astronomer to Rembrandt's famous etching Faust has been widely recognized. Vermeer clearly drew inspiration from Rembrandt's work, which shows a scholar alone in his shadowy library, standing-not sitting-at his desk, absorbed in contemplation, his face and thoughts illuminated by the diffused light from a stained glass window. The desk of Vermeer's young scholar is arrayed much like the work surface in the print, with a table carpet, open books, and a prominent celestial globe.
In Rembrandt's etching, a mystical apparition dominates the scene: a luminous medallion, encoded with letters, and a pair of hands, one of which points to a puzzling

oval disk, sometimes identified as a mirror, sometimes as an astrolabe. This enigmatic scholar has been variously interpreted as an alchemist or the literary character Dr. Faustus, who surrendered his soul to the devil for unlimited knowledge. Vermeer brings the scene down to Earth in his painting, yet he captured some of the evocative qualities of Rembrandt's work to enliven the interior world of a scholar in search of esoteric knowledge.

Albrecht Dürer
German, 1471-1528
The Northern Hemisphere of the Celestial Globe, 1515 (probably printed in 17th century)
Woodcut
Gift of Richard H. Zinser P.12,787

Albrecht Dürer's renowned celestial maps of the northern and southern hemisphere were the first star charts ever to be printed. The 48 classical constellations-the twelve signs of the zodiac, Orion, the Great Bear, and so on-that make of up core of these charts were carefully catalogued by Ptolemy in his Almagest. There were a number of drawn precedents of celestial maps found in Arabic and European illuminated manuscripts, and Dürer's designs, in fact, rely heavily on two drawn on vellum in Nuremberg, his hometown. Yet he updated the positions of the stars to show their locations around 1500, working closely with Nuremberg mathematician Conrand Heinfogel and the imperial astronomer Johann Stabius, who commissioned these woodcuts. A century of celestial globe makers took their information from these pioneering star charts, including Gerard Mercator whose 1551 globe is on loan from the Adler Planetarium.

Julius Schiller
German, died 1627
Noah's Ark (Argo Navis or the Ship of the Argonauts), 1627
Hand-colored engraving
Constellation 41 from Coelum Stellatum Christianum (Christian Starry Heavens)Published by Andreas Aperger, Augsburg, 1627Engraved by Lucas Kilian after Mathias Kager
The Minnich Collection, The Ethel Morrison Van Derlip Fund P.14,663

Photographic enlargement of Johannes Vermeer's Astronomer, painted in 1668, oil on canvas. This image is three times the size of the original, which measures 19 11/16" x 17 3/4." Courtesy of the Musée du Louvre, Paris, on loan to the MIA from October 18, 2009 through January 10, 2010.

In Search of the Center of the Universe

It was a Catholic cleric, a Pole named Nicholas Copernicus (1473-1543), who first published the revolutionary idea of a solar system, proposing in 1543 that the Earth and other planets orbited the Sun. Though commonplace today, Copernicus's theory would not find wide acceptance until the close of the next century. A popular compromise favored in Vermeer's time was the complicated hybrid system devised by the Danish astronomer Tycho Brahe (1546-1601), the so-called geo-heliocentric model. Here, the Earth was at the center of the universe, the Sun and the Moon revolved around the Earth, and the rest of the planets orbited the Sun.

Tycho's and Copernicus's models were joined in the annals of astronomy with yet another conception, one first formulated in ancient Greece and described by Aristotle and Ptolemy, which regarded the Earth as an unmoving, perfect sphere at the center of the universe. The Church embraced the Earth-centered (geocentric) model, zealously opposing the idea of a Sun-centered universe throughout the 17th century (and officially into the 19th century). Indeed, Giordano Bruno (1548-1600) was burned at the stake by the Inquisition in Rome for, among other heresies, his advocacy of the heliocentric model. In 1633, the Inquisition placed Galileo (1564-1642) under house arrest for the same reason.

As the prints in this exhibition demonstrate, the publishers of 17th-century atlases and astronomy books saw a market for the array of competing cosmological systems-the geocentric or Ptolemaic universe, the heliocentric or Copernican model, and the Tychonic system of Tycho Brahe. Eventually, advances in telescope technology, and the rigors of scientific investigation persuaded astronomers to dispel the old world order and allow Copernicus's heretical concepts to prevail: a Sun-centered cosmos and an Earth in constant motion.