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Edited by Wolfram Koeppe

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A PICTURE ALBUM

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MAKING MARVELS
A PICTURE ALBUM

THE METROPOLITAN MUSEUM OF ART, NEW YORK
From the Renaissance to the Enlightenment, marvels inspired extraordinary advances in science, technology, and the arts.
Today the word *marvel* is applied to anything from films to video games, but, for a certain period in early modern history, it signified a truly spectacular invention. In the Renaissance, Baroque, and early Enlightenment periods—a transformative era in Europe, between the outdated medieval order and the tumult wrought by the French Revolution—the pursuit of the marvelous was closely associated with the quest for innovation. Often, objects intended to express majesty and opulence also signaled major advances in science, technology, and the arts.

The definition of what was marvelous depended in part on scholars, clergymen, and, especially, princes, for whom natural wonders represented both their material possessions and their power over the natural and human world. For the early modern ruler, authority was conferred by not only the *possession* of wealth and
titles, but their expression. By building Kunstkammern, or “cabinets of curiosity”—thoughtfully selected collections of objects and instruments, each more handsome, inventive, or astounding than the next—and embracing practices that showcased their skill and erudition, princes of the era proclaimed their right to rule.

Marvels came in many forms and were usually ostentatious, standing out among the objects in a collection to captivate visitors with their superior craftsmanship, ingenious functionality, and sparkling materials. Chief among the last was silver, which was itself a form of currency and thereby an expression of wealth. The sheer value of this treasured material, combined with its sheen, resistance to corrosion, and malleability, inspired artisans to fashion silver items for their affluent clients.
Page 04:
Centerpiece, 16th century

Page 05:
Writing Box, ca. 1560/70

This Page:
Automaton Clock, 17th century
ABOVE: Miniature Collector's Cabinet, ca. 1600

OPPOSITE: The Cittern Player Automaton, 17th century
A ruler’s possession of a wide-ranging and all-encompassing collection became a symbol of his mastery over the world.
Silver showpieces were but one facet of the princely treasure. Nearly every ruling dynasty in Europe between 1550 and 1750 amassed vast collections of precious and amusing objects. The attractiveness and value of these Kunstkammern evinced the power of the rulers who assembled them, for they presented a rich display of natural, scientific, and artistic wonders, and they were considered expressions of their owners’ virtue, status, and erudition.

Beginning in the early sixteenth century, discoveries from the New World together with a flowering of the arts, a radically altered cosmology, and improved technologies sparked wonder and curiosity for which the Kunstkammer provided an ideal setting. Collectors favored astounding examples of virtuosic skill and
human creativity as well as extremely rare, beautiful, or unusual products of nature, and they sought out artifacts from foreign lands, finds from the remote past, and special tokens and portraits of former or contemporary figures, not to mention innovative tools, scientific instruments, automata, and clocks. All of these made Kunstkammern seem like mirror images of the divine creation—microcosms reflecting the macrocosm created by God.

Since these collections of marvels were intended to evoke awe, they naturally included assemblages of gemstones. These signaled a prince’s ownership of valuable natural wonders and when cut into sparkling jewels implied an understanding of proportion, geometry, and refraction. Long invested with talismanic meanings, astral powers, and medicinal properties, gemstones were splendid markers of wealth and scientific possibility.
PAGE 12:
Hat Ornament with the “Dresden Green” Diamond, second half of 18th century

PAGE 13:
Ostrich Egg Ewer, ca. 1630

THIS PAGE:
Drinking Horn, ca. 1540–50
OPPOSITE:
Grotesque Wild Boar, 1603–9

ABOVE:
Turtle Automaton with Neptune as Vintner, 1626
Collecting practices of the sixteenth and seventeenth centuries gave rise to courtly marvels that were central to the growth of a new experimental philosophy.
Before the early modern period, forms of knowledge had been separated: certain knowledge was the realm of theologians and university-trained practitioners of the exact sciences, while sensory engagement with nature was the realm of artisans, who achieved mastery over natural materials through the mechanical arts. The joining of these two realms was one of the most consequential results of the centralization of wealth and power that underpinned the flourishing of the noble courts of Europe.

These courts competed to attract and retain highly skilled artisans, who could produce the marvels that represented and sustained princely power. Artisanal skill involved a deep knowledge of materials and the processes used in their manipulation. Artisans passed this knowledge on to princes, whose education in science, craft, and natural philosophy was essential to the foundations of their leadership.

Among the modes of instruction deemed most suitable for a prince was ivory turning. Beginning in the sixteenth century, artisans pioneered a method
of working raw ivory into dazzling forms via the lathe, a machine traditionally used to generate decorative elements of architecture or furniture. Ivory turning required a deep understanding of mathematics, which was essential as well for military pursuits (specifically ballistics and fortifications), land surveying, and astronomical calculation—all activities closely associated with power.

Of course, the princely life was not solely occupied with the acquisition of useful technical skills: some marvels served mainly to entertain and amuse. These wondrous objects were richly outfitted with jewels, “exotic” hardwoods, and other precious materials, which rendered them as artful as they were diverting.
PAGE 21:
Drinking Cup, 1630

THIS PAGE:
Turned-Ivory Piece, ca. 1600
ABOVE:
Chess and Tric-Trac Game Board, 16th century or later

OPPOSITE:
Pietre Dure Night Clock, 1704–5
THIS PAGE:
Casket, ca. 1680
For European rulers, the exploration of astronomy and pursuit of alchemy were part of the effort to demonstrate mastery over the natural world.
As a repository of a prince’s collection, a *Kunstkammer* was a reflection of his worldview. Owning objects that spoke to new developments in science and technology helped further one’s reputation as a wise, judicious ruler. Though they took utilitarian form, these objects were often as superbly designed, constructed, and adorned as the most precious decorative arts.

The princely engagement with science was perhaps most evident with astronomy. In fact, most European rulers established centers of astronomical observation at their courts. Understanding the movement of the heavens allowed for more accurate timekeeping, measurement, and astronomical prediction, and instruments that mapped the stars and planets lent their owners certain advantages—such as forecasting the harvest, or even an individual’s fate. These objects built on the ancient foundations of the astrolabe and
the sundial, and contributed to the notable scientific developments of the Age of Enlightenment.

In addition to astronomy, rulers across Europe funneled resources toward developing new artisanal, metallurgical, and medicinal products and processes. These efforts were all joined under one field—alchemy—which reached its golden age in Europe in the sixteenth and seventeenth centuries. Alchemy was a complex discipline centered on transforming, purifying, and understanding matter. It was believed that if one could determine what made up valuable materials such as gold, glass, and gemstones, these materials could be recreated in the laboratory for the enrichment of the realm. And since the processes involved in alchemical experimentation were as important as the end products themselves, the Kunstkammer displayed not only beautiful objects but also the remarkable instruments used to manufacture them.
PAGE 30:  
Aeolipile (Steam Blower), ca. 1590–1600

PAGE 31:  
Microscope, ca. 1750

THIS PAGE:  
Portable Diptych Sundial, 1602
OPPOSITE:
Equation Clock, 1591

ABOVE:
Desk Set with Telescope and Writing Utensils, 17th century
Technical sophistication, material splendor, exquisite craftsmanship, and ingenious invention converged in clocks and other mechanically driven marvels.
Clocks have always been about more than telling time. Following the Bible, medieval and early modern theorists likened the universe to a vast mechanical clock, a comparison that dominated the polemics of the day and rendered clocks symbolic of the wider world. As such, they were greatly sought after for the Kunstkammer, which was itself conceived as a universe in miniature.

Timepieces of the period were sophisticated instruments with complicated movements, and their exteriors were often equally elaborate, boasting sumptuous materials and ambitious decorations. In many cases, their creation involved cabinetmakers, goldsmiths, enamelists, sculptors, and even makers of musical instruments. Some of the largest examples combined timekeeping with planetary and astrological readings, but even the smallest personal timepieces were extravagantly designed.

The increasingly complex technologies driving clockworks were eventually adapted for use in movable automata. These animated curios, seemingly driven by a divine hand yet wholly the product of their makers’ skill and innovation, spoke to the potential of human ingenuity in an era of unparalleled scientific advancement.
and discovery. Growing more ambitious, inventors then tried to create machines that could mimic human motion and seem to react intelligently to commands. Their ambition led to astonishing figural automata that could “walk” and gesture as though they were living beings, or even carry out more complicated feats, such as playing chess or writing poetry. Not surprisingly, these moving marvels were among the most coveted items for a princely collection.

Clocks and automata have long reflected humanity’s curiosity and quest for knowledge. In their precise and often mysterious workings, these fascinating machines draw connections between the divinity of the cosmos and the humanist potential to harness or control its power. In the sixteenth, seventeenth, and eighteenth centuries, rulers across Europe used their wealth and status to cultivate an environment where such creativity and ingenuity could blossom. Beauty and innovation thus came together at the courts of early modern Europe, where science and splendor were pursued with equal vigor and together helped form a culture of magnificence.
Musical Automaton Clock, ca. 1625
OPPOSITE:
Miraculous Writing Machine, 1760

ABOVE:
Caricature of Engravers “à la Grecque,” 18th century
OPPOSITE:
Automaton Clock, 1600–1610

ABOVE:
The Moving Monk, ca. 1550
**Cover (detail)**
- Green Turban Shell Cup and Cover
  - Stand: Johann Joachim Busch (1720–1802)
  - Cup and cover: German (?), ca. 1600; stand: German, Mecklenburg, before 1753
  - Green turban snail shell (Turbo marmoratus), silver (gilded), brass (cast, partially gilded)
  - H. 14 ½ in. (36 cm)
  - Staatliche Schlösser, Gärten und Kunstsammlungen Mecklenburg-Vorpommern, Schwerin (KH 887)

**Page 1**
- Watch
  - Wenzel Jamnitzer (1507/8–1585)
  - German, Nuremberg, ca. 1600
  - Leather (dyed, gold-Tooled); pine, poplar, pear- and yew woods; veneers of ivory, mother-of-pearl, and pear., plum, ebony, rose, holly, ash, and green-stained poplar woods; metal (gilded); glass (painted)
  - H. 6 ½ in. (16.5 cm), W. 7 ¼ in. (18.7 cm), D. 5 ½ in. (14 cm)
  - The Metropolitan Museum of Art, New York, Gift of Susan Dwight Bliss, 1948 (48.59.2)

**Page 2 (detail)**
- Celestial Globe with Clockwork
  - Gerhard Emnoser (active 1556–84)
  - Austrian, Vienna, 1579
  - Silver (partially gilded), brass (gilded), steel
  - H. 10 ½ in. (27.3 cm), W. 8 in. (20.3 cm), D. 7 ½ in. (19.1 cm)
  - Diam. of globe 5 ½ in. (14 cm)
  - The Metropolitan Museum of Art, New York, Gift of J. Pierpont Morgan, 1917 (17.190.1520)

**Page 4**
- Centerpiece in the Form of a Galley
  - Joseph Mayer (d. 1609)
  - German, Augsburg, ca. 1670
  - Gold, brass (gilded), steel (partly blued), enamel (painted, raised), rubies
  - H. 2 3⁄8 in. (6 cm), W. 8 7⁄8 in. (22.7 cm), D. 4 in. (10.2 cm)
  - Kunstkammer, Kunsthistorisches Museum, Dresden (N 171)

**Page 5 (detail)**
- Writing Box
  - Wenzel Jamnitzer (1507/8–1585)
  - German, Nuremberg, ca. 1560/70
  - Silver (gilded), lead
  - H. 2 ½ in. (6 cm), W. 8 7⁄8 in. (22.7 cm), D. 4 in. (10.2 cm)
  - Kunstkammer, Kunsthistorisches Museum, Vienna (KK 155)

**Pages 6–7 (detail)**
- Automaton Clock with Pacing Lion
  - Daniel Lotter (active 1620–1699)
  - German, Augsburg, ca. 1690; additions ca. 1655–80
  - Silver (cast, partly gilded), bronze, ebony, enamel
  - H. 10 ½ in. (26.7 cm), W. 10 in. (25.4 cm), D. 7 in. (17.8 cm)
The text for this book was adapted from *Making Marvels: Science and Splendor at the Courts of Europe*, edited by Wolfram Koepppe, Marina Kellen French Curator in the Department of European Sculpture and Decorative Arts, and published in conjunction with an exhibition on view at The Metropolitan Museum of Art, New York, from November 25, 2019, to March 1, 2020.

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