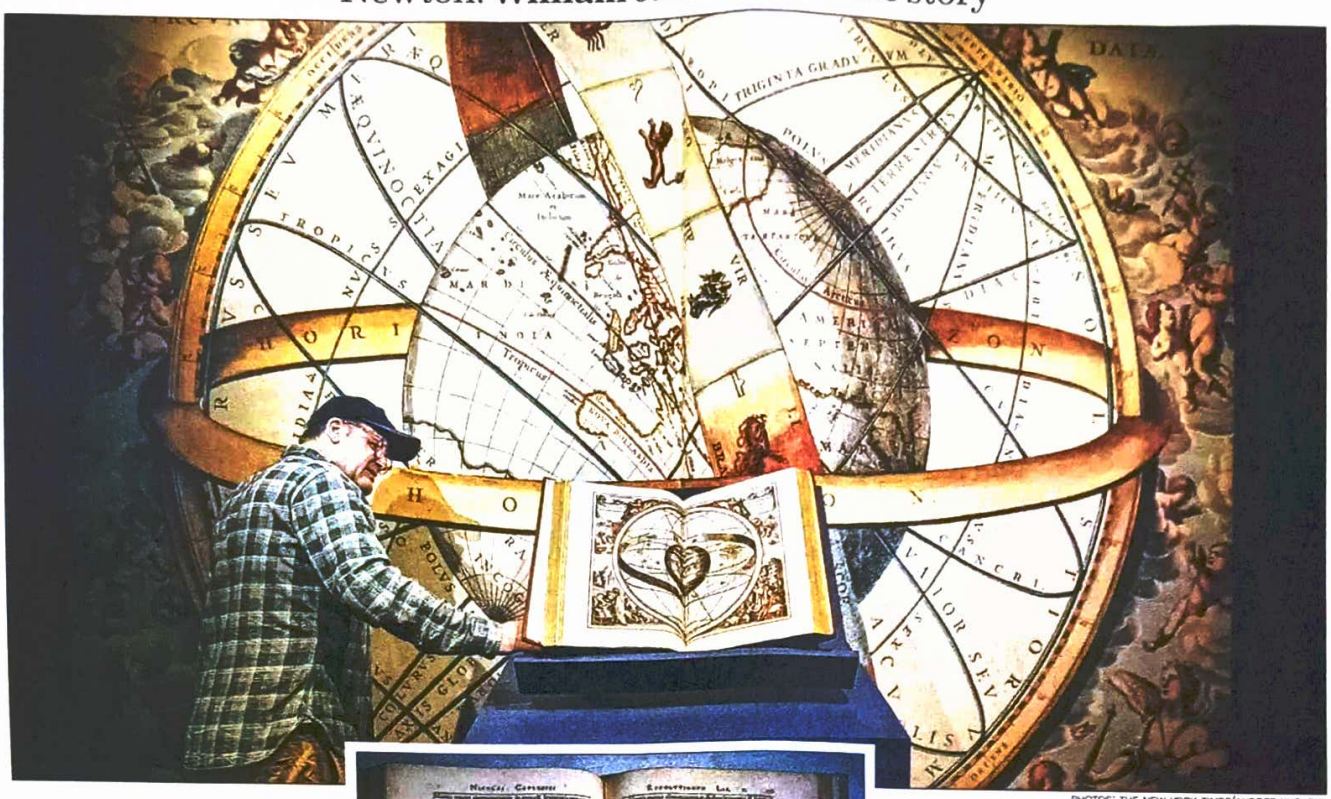
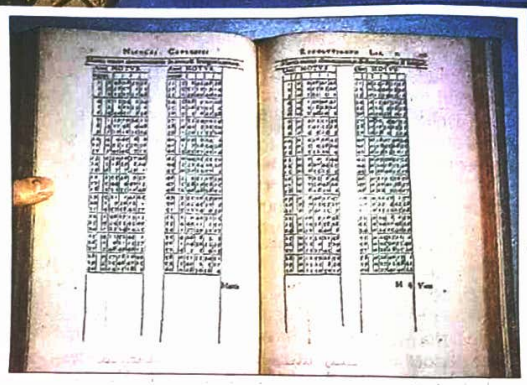
Going for $2 million

Sotheby's recently auctioned rare first editions of Copernicus, Galileo and Newton. **William J. Broad** has the story





PHOTOS: THE NEW YORK TIMES/ANDRES KUDACKI

BOOKED: A man flips through a rare science book; (below) *De revolutionibus orbium coelestium* by Copernicus

The primates known as humans, after ages of unawareness, managed to unveil the hidden dynamics of the universe in little more than a century.

It happened between 1543 and 1687, when Nicolaus Copernicus, Galileo Galilei and Isaac Newton overturned Roman Catholic dogma and replaced it with a startling portrait of the universe. Their individual toils illuminated the mysteries of the solar system and then expanded to those of the wider cosmos.

The masterworks of these pioneers, as well as hundreds of other rare science books, were recently on display at Sotheby's New York, US, before they went up for auction. The ensemble consisted of landmark works and first editions that are, according to Sotheby's, coming onto the book market after decades in private collections.

"It's a re-emergence," said Richard Austin, Sotheby's global head of books and manuscripts. No gloves were needed, he added, if visitors washed their hands carefully before handling the books.

"You can look at these things online," he said. "But it's a very different experience when you hold them in your hands and say, 'This is a book that changed our understanding of the universe.'"

The exhibition Reason and Revolution highlighted books that detail scientific turning points. The opus by Copernicus has the highest opening bid estimate — up to $1 million. Overall, Sotheby's expects proceeds of up to $7 million.

Copernicus' *De revolutionibus orbium coelestium*, or *On the Revolutions of the Heavenly Spheres*, revolutionised astronomy and initiated the birth of modern science. A triumph of intellectual history, this book laid out evidence showing that Earth and the other planets revolve around the sun. The 400-page tome was technically bold, packed with mathematics, drawings and tables.

Published in 1543, Copernicus' manuscript contradicted the Roman Catholic Church, and in time, the church decided to show its displeasure. In 1600, it had Giordano Bruno, an advocate of the heliocentric theory, burned at the stake. Today in Rome, a statue of Bruno overlooks the Campo dei Fiori, where the philosopher was burned alive for heresy, its shadowed face looking defiantly in the direction of the Vatican.

The book's early pages feature Copernicus' diagram of the solar system. It shows the sun at the centre and the paths of the known planets arranged in increasingly larger orbits. The text, after discussing the orbiters, declares in Latin *In medio uero omnium residet Sol* — "But the Sun resides at the centre of everything."

His planetary tabulations let astronomers, navigators and calendar makers use his heliocentric model to compute and predict with new accuracy the longitudes and latitudes of the planets, the sun and the moon for any given date. In time, his breakthrough played a role in the reform of the Gregorian calendar, which much of the world now uses.

Galileo's *Sidereus Nuncius*, or *Starry Messenger*, was written in the thrall of discovery. He turned the newly invented telescope on the heavens, bringing into view lunar features and bright points of light once invisible to the human eye. Overnight, he became the founder of modern observational astronomy. Galileo made a run of findings that reinforced the Copernican worldview and reimagined what lay beyond.

The book was a steppingstone to his great work *Dialogue Concerning the Two Chief World Systems*, published in 1632. His new endeavour strongly backed Copernicus, whose book the Catholic Church had put on its prohibited list. Galileo, too, felt the lash. In 1633, the Roman Inquisition put the Italian astronomer on trial. The spectacle of the elderly thinker being forced, under threat of torture, to recant his celestial views came to symbolise the church's hostility to open inquiry.

Galileo's greatest discovery took up the greatest part of his book: that Jupiter was accompanied by four moons — a figure modern observers have expanded to 115. A Sotheby's write-up notes that Galileo described the exact moment — January 11, 1610 — when he increased his moon count from three to four. Once again, his finding undermined the church. The astute observer had demonstrated that not everything in the heavens circled Earth.

The most cosmic of Galileo's discoveries was that the night sky held at least 10 times as many stars as those visible to the naked eye. His diagram of the Pleiades cluster showed a field of 35 stars but just six (drawn larger) as naked-eye objects. So, too, he suggested that the bright band of the Milky Way and similar nebulous parts of the dark sky hinted at the existence of "innumerable stars grouped together" — setting the stage for the modern concept of galaxies.

Newton's *Philosophiae Naturalis Principia Mathematica*, or *The Mathematical Principles of Natural Philosophy*, eventually became known simply as *The Principles*. His forerunners had described the workings of the heavens. Newton explained them.

In his book, Newton diagrams the path of the great comet of 1680, whose long tail arced across the night sky.

The ghostly streaks of comets had long been seen as portents of calamity. Kings trembled. Now, in Newton's hands, they became just another part of nature's great whirling machine, their arrival controlled by gravity rather than the malevolent gods.

Page after page of the book features knotty diagrams that explain the invisible forces at work on the moon, the sun, the planets and Earth — notably its oceans and tides. Newton showed why they rise and fall with great predictability. The book also took on pendulum rates, orbital anomalies, the precession of the equinoxes, the drag of fluids, the speed of sound and the spiralling marvels known as vortices.

Despite its reputation for unreadability — fostered by its hundreds of equations, diagrams and obscure references — Newton's 1687 book became a sensation in his lifetime. His discovery of gravity unlocked the universe, and his magnum opus laid out a method of inquiry that became the gold standard.

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