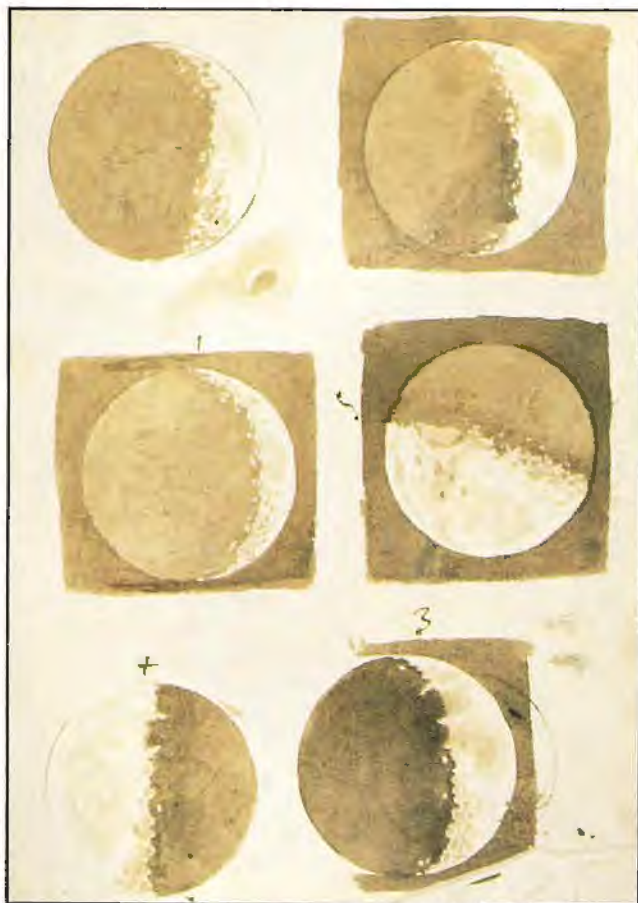


Amateur Astronomers

Conducted by Stephen James O'Meara



These controversial brown-ink-wash images of the Moon were purportedly made by Galileo in 1609. Although many historians accept this fact as being true, Harvard historian Owen Gingerich and lunar expert Ewen A. Whitaker of the University of Arizona disagree. They believe that these and one other wash appearing among the Galileo papers in Florence, Italy, are not originals, but rather copies made later. Details of their arguments appear in the *Journal for the History of Astronomy*, Volume 9, 1978, pages 155-169. Photograph courtesy Gingerich and the Biblioteca Nazionale in Florence.

PAINTING THE MOON

GALILEO, aging and disturbed by his deteriorating eyesight, consoled himself by reflecting upon the unforeseen wonders his modest telescopes had revealed: an abundance of stars, the four largest moons of Jupiter, and the Moon's rugged terrain. "Since Adam," he wrote, "no one else has seen more than I."

The thrill of those initial observations can still excite us today. As Galileo wrote in his book *Sidereus nuncius* (as translated by Stillman Drake),

It is a very beautiful thing, and most gratifying to the sight, to behold the body of the moon, distant from us almost sixty earthly radii, as if it were no farther than two such measures. . . . In this way one may learn with all certainty of sense that the moon is not robed in a smooth and polished surface but is in fact rough and uneven, covered everywhere, just like the earth's surface, with huge prominences, deep valleys, and chasms.

Seven sepia-wash sketches of the Moon, dating from late 1609 and early 1610, survive among the Galilean papers at the Biblioteca Nazionale in Florence, Italy.

Historians accept their authenticity in part because Galileo's artistic talents were lauded by his contemporaries. Indeed the Florentine artist Lodovico Cardi da Cigoli acknowledged the scientist as his "maestro" in matters of perspective drawing.

Interesting and historic as Galileo's paintings are, the circumstances of their execution remain controversial. His biographer Drake tacitly assumes that Galileo sketched them at the telescope, and that the series reflects a growing adeptness at depicting the view. Others, such as art historian Samuel Edgerton, disagree. He contends that Galileo would have been too excited to make careful ink washes at the time. Like any 17th-century artist, his brushwork was "composed not *en plein air* [in open air] but in the 'studio.'"

For astronomer and historian Owen Gingerich the watercolor technique — laying down many shades of ink and brushing them around a white patch to create a highlight — is incompatible with telescopic observation. However, Galileo



Were Galileo's famous Moon drawings made while he was at the telescope, or were they completed at some later date? We may never know the answer to this question. Fascinated by this historical dilemma, Massachusetts artist and amateur astronomer Elizabeth Cavicchi (*right*) set out to discover the answer. Her own watercolor renditions of the Moon (*above*) were made behind the telescope, proving that it would have been possible for Galileo to do so as well.



may have found this technique an appropriate way of immediately recording and later communicating his discoveries. His goal was not to compose a Renaissance landscape but to document a territory novel to science.

Perhaps we can glean something of Galileo's attitude in making his sketches from indirect sources. A passage in *Sidereus nuncius* accompanies an engraving of the Moon and emphasizes that the book's illustrations are intended to be realistic, and not just symbolic:

There is another thing which I must not omit, for I beheld it not without a certain wonder: this is that almost in the center of the moon there is a cavity larger than all the rest, and perfectly round in shape. I have observed it near both first and last quarters and have tried to represent it as correctly as possible. . . . As to light and shade, it offers the same appearance as would a region like Bohemia, if that were enclosed on all sides by very lofty mountains arranged exactly in a circle.

Selenographer Ewen A. Whitaker has identified the large central crater as Albatagnius, exaggerated in size probably for the reader's benefit. He also identified this engraving as corresponding to one of Galileo's manuscript paintings. Indeed, three of the book's four lunar representations can be matched with wash drawings, such as those illustrated on page 313. These ink sketches may be the originals used to prepare the engravings, or both may have been made from one original. In either case, there is an impressive correspondence between features drawn by Galileo and those on the actual Moon.

MY TURN

Inspired by Galileo's work and words, I began a series of some 30 watercolors painted while observing the Moon. A flashlight, street lamp, or porch light illuminated my drawing paper, while a few brushes, water, ink, and a tray sufficed for drawing. Among my problems was the fact that the ink crystallized on freezing nights and hampered my work.

My India-ink wash renditions of our satellite are each some 12 centimeters in diameter, compared to about 5½ for Galileo's. They were produced, brushstroke by brushstroke, between repeated glimpses through a telescope. For the first dozen nights I outlined salient features in pencil before applying the ink, but later this seemed unnecessary.

For observing I used one instrument with an aperture of 40 millimeters that magnified 20 times and another with a 55-mm aperture and magnification that varied from 20 to 60 times. Although my telescopes are optically superior to Galileo's, to a novice the dramatic impact of viewing the Moon must be comparable. The telescope supports I used were diverse and unreliable: a collapsing tripod, picnic

table, garbage-pail lid, auto hood, kitchen chair, or sacks of fertilizer.

I completed each sketch in about an hour, and Galileo's smaller ones may have taken proportionally less time. They show some exaggeration in shading and scale due to the spontaneity of the process. This was part of the experiment. My images are not a literal map but a response to the Moon's surface — its "luminous excrescences" and "large and ancient spots." In Galileo's case, his instrument's small field of view, perhaps 15 arc minutes, accommodated only part of the Moon's surface and may have imposed further distortion into his paintings.

We may never know whether Galileo's lunar sketches were produced during his nighttime vigils or later during the day. But he *could* have drawn at the telescope, as my exercises suggest. The hand in painting assists the eye in seeing, just as the artist's imaginative reconstruction of a form contributes to and benefits from scientific understanding. My artistic background gave me a fresh, empirical route for exploring this historical dilemma and capturing the excitement of those early discoveries.

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