Letter to the Editor of *Sky & Telescope* magazine (May 2006). Letter title, image of Galileo, and image caption added by *Sky & Telescope*.

The published version of this letter included editorial changes to its content made after the final proof was reviewed by the author. The most significant of these changes was to alter the wording of the last paragraph so as to call into question Galileo's ethics. These changes were not approved by the author. At the author's request *Sky & Telescope* published a correction regarding one of these changes (July 2007). This correction is included on page 2. A second, less important error was left uncorrected by the author. The original text of the letter from the galley proof is also included here on page 2.

According to Valerie Coffey, Managing Editor of Sky Publishing Corporation, *Sky & Telescope* does routinely have to edit letters for space and clarity, but changes are also typically approved by the author. It was not clear to Ms. Coffey why the changes were inserted, and the person responsible for the changes was no longer with Sky Publishing. Ms. Coffee offered her apologies for casting unintended aspersions on Galileo's ethics and said they will make a point to prevent such an occurrence in the future. (Ms. Coffee's comment from an e-mail of 10/04/06, used with permission).

letters

Galileo's Pride and Prejudice

"A New View of Mizar" by Leos Ondra (July 2004, page 72) discusses how Galileo, in a search for direct evidence of Earth's motion, observed the double star Mizar in Ursa Major in an attempt to measure its parallax. However, Ondra inadvertently raises interesting questions regarding Galileo's assumptions about the universe and the conclusions that he drew from his observations.

Ondra dates Galileo's observations of Mizar to 1617. Certainly Galileo would have been very interested in parallax at that time, for Cardinal Robert Bellarmine had recently (1615) written that Catholic authorities would accept the heliocentric theory if direct evidence for Earth's motion were obtained. Ondra finds that Galileo measured the apparent diameters of Mizar's component stars to be 6 and 4 arcseconds, separated by 15 arcseconds. To determine their distances, Galileo assumed that all stars were roughly the same size as the Sun, then calculated that since Mizar A was 1/300 the apparent size of the Sun, it must be 300 astronomical units distant (Mizar B would be 450 a.u. distant).

Galileo knew nothing of light from a point source diffracting through a circular aperture and couldn't know that the sizes he measured were due to wave optics and didn't reflect the stars' dimensions. His size measurements and his distance calculations would seem as good as his assumption that the stars were suns.

Galileo must have expected the components of Mizar to swing around each other dramatically as he observed them over a period of weeks and months. Based on his calculations he would have expected A and B to have parallax angles of ±11.5 and ±7.6 arcminutes, respectively. Their relative motion would dwarf their separation. But in fact, Mizar A and B do not budge.

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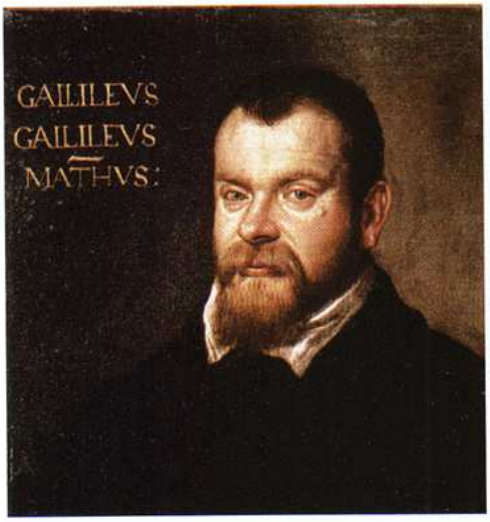

NATIONAL MARITIME MUSEUM

Galileo, along with his student Benedetto Castelli, was the first to discover and observe binary stars. But what did those observations reveal about Galileo's scientific integrity? This portrait was made by Domenico Robusti around 1605–07.

Since no parallax is seen, Galileo logically had to conclude either that Earth was stationary or that his assumption regarding stars being suns at differing distances from Earth was wrong.

Yet Ondra reminds us that in *Dialogue Concerning the Two Chief World Systems* (1632), Galileo argues that 1st-magnitude and 6th-magnitude stars the same size as the Sun have apparent sizes of 5 and 5/6 arcseconds, respectively; that stars are the same size as the Sun; and that since 5/6 arcsecond is 1/2160 the size of the Sun, 6th-magnitude stars are 2,160 a.u. distant — arguments in line with his work on Mizar. He states, "If some tiny star were found by the telescope quite close to some of the larger ones, and if that one were therefore very remote, it might happen that some sensible alterations would take place among them." He goes on to suggest that the "sensible alterations," or parallax, would provide proof of Earth's motion.

The *Dialogue* conflicts with Galileo's earlier work on Mizar, raising some very interesting ethical points. Had Galileo published his Mizar observations, they would have influenced the ongoing debate regarding Earth's motion, likely prolonging the time before the geocentric theory was finally overturned. It would seem that at the time the *Dialogue* appeared, Galileo was sitting on results that strongly challenged the Copernican theory he was championing!

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Correction published July 2007

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For the Record

- *The last paragraph of Chris Graney's letter about Galileo's attempt to measure stellar parallax (May 2006, page 12) should have begun as follows: "The* Dialogue *conflicts with Galileo's earlier work on Mizar, raising interesting points."*
- *Playwright George Bernard Shaw was not British (March issue, page 8); he was born in Dublin, Ireland.*

Original text of letter from final proof (sections that were changed in the published version are highlighted)

"A New View of Mizar" by Leos Ondra (July 2004, page 72) discusses how Galileo, in a search for direct evidence of Earth's motion, observed the double star Mizar in Ursa Major in an attempt to measure its parallax. However, Ondra inadvertently raises interesting questions regarding Galileo's assumptions about the universe and the conclusions that he drew from his observations.

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Galileo knew nothing of light from a point source diffracting through a circular aperture and couldn't know that the sizes he measured were due to wave optics and did not reflect the stars' dimensions. His size measurements would seem good, and his distance calculations would seem as good as his assumption that the stars were suns.

Galileo must have expected the components of Mizar to swing around each other dramatically as he observed them over a period of weeks and months. Based on his calculations he would have expected A and B to have parallax angles of ±11.5 and ±7.6 arcminutes, respectively. Their relative motion would dwarf their separation. But in fact Mizar A and B do not budge. Since no parallax is seen, Galileo logically had to conclude either that the Earth was stationary or that his assumption regarding stars being suns at differing distances from Earth was wrong.

Yet Galileo asserts both these things in his *Dialogue Concerning the Two Chief World Systems* (1632). In the *Dialogue*, Galileo argues that 1st-magnitude and 6th-magnitude stars have apparent sizes of 5 and [5/6] arcsecond, respectively, that stars are the same size as the Sun, and that since [5/6] arcsecond is [1/2160] the size of the Sun, 6th-magnitude stars are 2160 a.u. distant — arguments in line with his work on Mizar. He states, "If some tiny star were found by the telescope quite close to some of the larger ones, and if that one were therefore very remote, it

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