

# HISTORY OF OPHTHALMOLOGY

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## The Enigma of Galileo's Eyesight: Some Novel Observations on Galileo Galilei's Vision and His Progression to Blindness

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**Abstract.** Galileo Galilei became blind. Before this happened he revealed that his left eye had always had less than perfect vision. A study of his written works, his handwriting, and the originals of the portraits undertaken during his lifetime indicate that this probably was the case. These portraits suggest that his left eye tended to lose fixation and that, at the age of 60, he suffered from a mucocoele of the right frontal sinus; but these conditions would not have caused blindness. Considering the systemic diseases from which he suffered over his lifetime, he could possibly have had a long standing uveitis with secondary pupillary block glaucoma, common in those with the group of conditions classified as sero-negative arthropathies. Posterior scleritis with secondary glaucoma is less likely. If either of these were the cause, then the disease was probably triggered by a well-documented, severe acute illness as a young adult, the inflammation being localized to the eye as a result of severe recurrent conjunctival infections in his youth. The intermittent nature of the visual loss, the normal appearance of the cornea and pupils in his portraits, the absence of any evidence of inflammatory joint disease, the presence of halos, and the severe nature of the pain—combined with the high level of visual acuity in between attacks and its persistence until the last few weeks of vision means that angle-closure glaucoma must also be considered. These suggestions might be confirmed or refuted by studying his remains. Application has been made for this to be done. (*Surv Ophthalmol* 54:630–640, 2009. © 2009 Elsevier Inc. All rights reserved.)

**Key words.** Blindness • Galilei • Galileo • portraits • vision

Between the middle of 1636 and the end of 1637, when Galileo Galilei was 72 years old, his vision deteriorated from being able to observe minute changes in the position of the moon to blindness. When his sight was failing fast, he reported to his patron, the Grand Duke Ferdinand II, “the loss of my right eye which is the one which has accomplished so many, let me say glorious labours. This eye, my dear sir, is now blind and the other one which was, and is now, imperfect is incapacitated.”

Is there any other evidence that Galileo's vision in his left eye had always been less than perfect? If so, what was the problem? Also what was it that led to his complete blindness, a relatively rare outcome even in the 17<sup>th</sup> century?

### Sources of Evidence

There can be no doubt that the vision in his right eye in Galileo's youth must have been superb, but

of course, his genius lay in being able to interpret and to record what he saw (Fig. 1). How imperfect was the left eye? The possible answer to this comes from three places. The main one is his own writings, together with those of his friends, colleagues, and family. Although these are extensive, the many letters that he wrote to his daughter, which might have been the most fruitful source, unfortunately, have been destroyed. Yet, much is still known about his medical history and the progression and eventual final stages of his eye disease. Two other sources are the study of his handwriting and the information derived from the previously unexplored study of his portraits.

#### THE WRITINGS OF GALILEO GALILEI (1564–1642) AND HIS FAMILY, FRIENDS, AND ASSOCIATES

Galileo Galilei was born in Pisa on February 15, 1564, the eldest of his parents' three sons and four

daughters. He was educated partly at Jacopo Borghini's school and partly by his father, Vincenzo, an impoverished descendent of the noble Buonajuti family. The family name was changed to Galileo when the head of the family became one of the ruling twelve men of the Republic of Florence in 1343. Vincenzo earned his living in business, but, a distinguished lute player, he studied and wrote about music. His experiments changed the theoretical concepts underlying musical composition, and he indubitably influenced his son regarding the value of combining mathematics with physical experimentation.<sup>17</sup>

Up to the age of 10, Galileo Galilei was educated in the public school in Pisa. He then went to join his father in Florence and was taught by his father and an "unsatisfactory" teacher, but he certainly wrote with a highly legible hand (Fig. 2). In 1576 or 1577, around the age of 12, Galileo entered the monastery of Vallombrosa near Florence to study "the Humanities,"

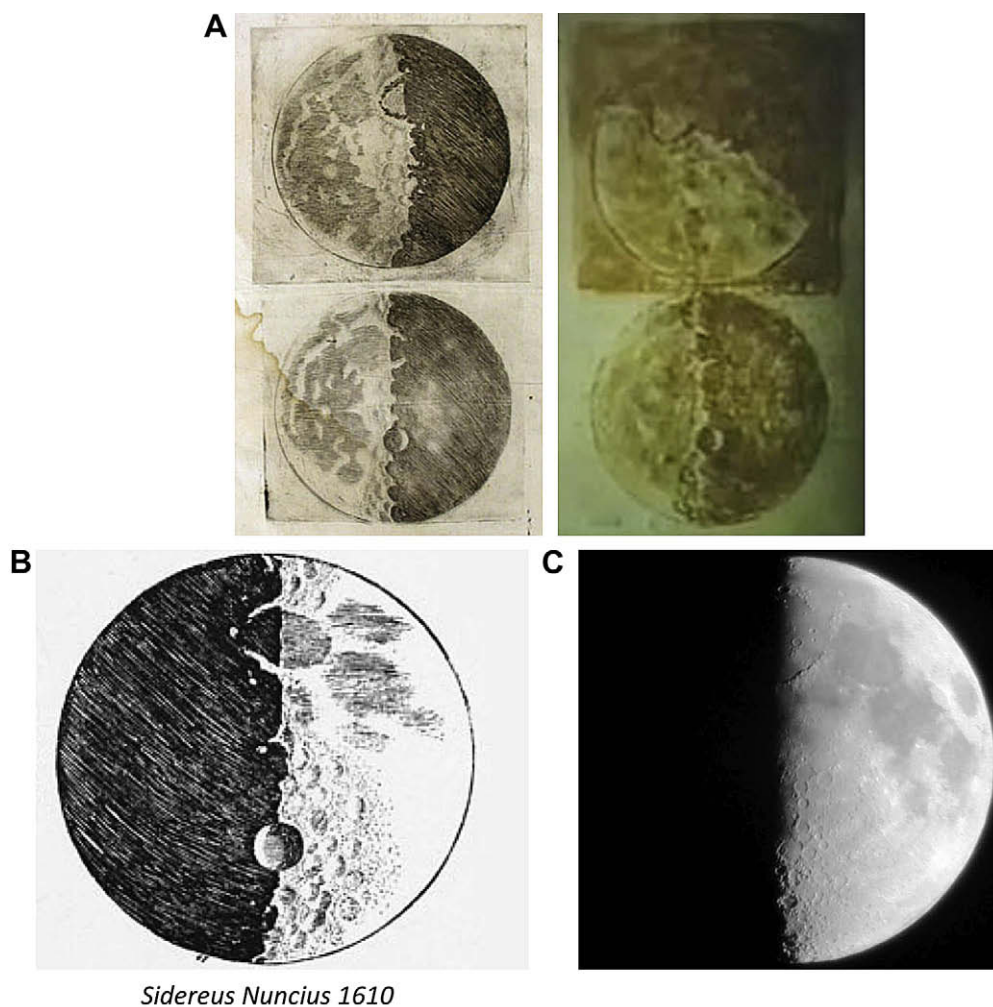


Fig. 1. Drawings of the moon in December 1609 using a telescope constructed by himself (A, B) compared with a modern digital photograph of the moon with the shadow in the same position (C). This shows the extraordinary accuracy of Galileo's observations and his artistic ability. (*Sidereus Nuncius* 1610 [private collection]. [www.pacifier.com~tpope](http://www.pacifier.com~tpope).)

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