

Biographical Encyclopedia of Astronomers

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Schickard, Wilhelm

Born Herrenberg, (Baden-Württemberg, Germany), 22 April 1592

Died Tübingen, (Baden-Württemberg, Germany), 23 October 1635

Wilhelm Schickard invented the first mechanical computer in 1623 to solve problems that arose in predicting planetary positions. His research included mathematics, cartography, and geodesy as well as astronomy

Son of Lukas Schickard, he was born into a family of master joiners, builders, and vicars. Schickard was educated at the renowned Tübinger Stift and the University of Tübingen. After receiving his BA in 1609 and MA in 1611, he continued to study primarily theology and oriental languages until 1613. He surely received his education in mathematics, physics, and astronomy from Michael Mästlin, professor of mathematics and astronomy in Tübingen from 1584 to 1631. In 1613, Schickard became a Lutheran minister in several towns around Tübingen, and in 1619, he was appointed professor of Hebrew at Tübingen University, teaching biblical languages such as Hebrew and Aramaic. His Hebrew textbook, *Horologium Hebraeum* of 1623, went into some 45 editions, being his most popular book

In 1617, Schickard first met Johannes Kepler, who had also studied theology in Tübingen and astronomy under Mästlin. Kepler

commissioned Schickard to engrave the woodcuts and copper plates for the second part of his *Epitome* and the *Harmonice Mundi* of 1618–1619. They remained friends; 20 letters from Schickard to Kepler and 14 from Kepler exist. Upon Mästlin's death in 1631, Schickard was appointed professor of astronomy (in addition to his Hebrew appointment). In fact, he assisted Mästlin in his lectures from 1620 and also taught mathematics and geodesy from 1631. Schickard corresponded with many scientists, including Matthias Bernegger, Pierre Gassendi, Daniel Mögling, Ismaël Boulliau, and Maarten van den Hove

Schickard's first astronomical work was his 1619 paper on his observations of the three spectacular comets of 1618 (C/1618 Q1, C/1618 V1, and C/1618 W1). This was followed in 1624 by his fundamental, 320-page monograph on the meteor of November 1623. He showed that meteorological studies could be as scientific as those of comets by Tycho Brahe and Mästlin. He was also a skilled mechanic and engraver in wood and copper plate

Schickard's work of 1632/1633 on the transits of Mercury from 1627 onward, his observational instruments having a mean error of 1' 21", is indeed remarkable. When he took over Mästlin's astronomical lectures in 1632, he gave out his own lectures in two parts. The theoretical part two was based on his *Picta Mathesis*, which is a remarkable attempt to present the full Copernican theory on the motion of the planets in a purely graphical way, using ruler and compass. Its strength lies in Schickard's deep knowledge of spherical trigonometry (working out the necessary formulae in a didactic, clear way) and its graphical representation by means

of descriptive geometry and stereographic projection. In fact, he He tested all projection methods. Its secret lay in his methodical and systematic approach, which focused on astronomy rather than mathematical theory. However, this forced him to use a purely Copernican approach. Schickard could not utilize the new astronomical laws introduced by his friend Kepler for elliptical orbits.

Schickard's brilliant achievements in the demanding field of lunar theory—his prints and drawings, dated between 1624 and 1632, reveal his comprehensive knowledge of the earlier work of Ptolemy, Al-Battani, Al-Fargani, Nicolaus Copernicus, Brahe, and Christian Severin (Longomontanus). His outstanding work on the theory of the Moon remained unfinished when he died of pestilence brought on by the Thirty Years' War. The marginalia of Schickard's annotated copy of Copernicus' *De revolutionibus* are remarkable. They again demonstrate his skill, wide-ranging knowledge of this celestial science, and his standing as an astronomer

Schickard is now best known for his 1623 invention of the first mechanical computer capable of performing the four arithmetic operations; Pascal's arithmetic machine came later in 1642. Schickard's machine is known from his letters to Kepler, in which he suggested a mechanical means to help him with his logarithmic calculations of ephemerides. Unfortunately, no original copies of this calculator exist, but a working model was constructed by B. von Freytag Löringhoff from written documents in Tübingen in 1960. Schickard's calculator is a curious and striking conception (similar to Leonardo da Vinci's imaginative inventions). Its capabilities, rediscovered after its reconstruction, have shown that it was indeed of practical use, despite the flaws inherent in its design

Schickard, an expert mechanic, constructed additional scientific instruments. His *tellurium*, the first portable Copernican planetarium (reconstructed in 1977), could be used to demonstrate the geocentric as well as the heliocentric system. His *rota hebraea* of 1621 was a device for the automation of Hebrew verb inflection. He was the first to apply Willebrord Snell's 1617 triangulation method to geodesy (1624–1629), particularly in his surveying of Württemberg. Since systematic research concerning Schickard's work began only in 1957, no critical edition of any of his works has yet appeared.

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