# Gerolamo Cardano

## A GENIUS BORN TO BE BAD?

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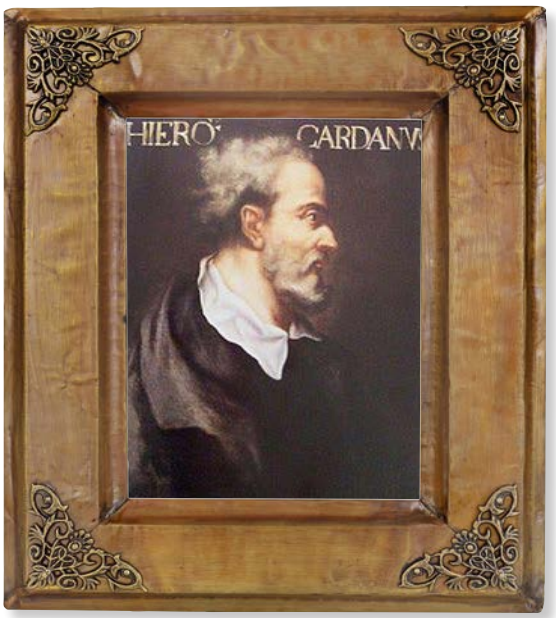


**Portrait of Cardano on display at the School of Mathematics and Statistics, University of St Andrews.**

**Gerolamo Cardano—where to begin?** He was an Italian polymath of mystery, mischief and mayhem who also managed to make significant contributions to gear technology and games of chance along the way. Born in Pavia, Lombardy in 1501, history is unsure of his correct first name. He was known as Gerolama, Girolama and Geronimo—so take your pick.

What *is* known is that he was a mathematician, physician, biologist, physicist, chemist, astrologer, astronomer, philosopher, writer—and gambler. He was credited as one of the most influential mathematicians of the Renaissance, as well as a central player in the "foundation of probability," and was the first to introduce binomial coefficients and the binomial theorem to the western world. He wrote more than 200 works on science.

As for gear science, Cardano "partially invented and described" such mechanical devices as the combination lock, the gimbal, and the "Cardan shaft" with universal joints that allow the transmission of rotary motion at various angles. It is still used today. He is also cited for his revolutionary work with hypocycloids, published in *De Proportionibus* (1570). The generating circles of these hypocycloids were later named Cardano circles and were used for the construction of the first high-speed printing presses. What's more, he is recognized for his breakthroughs in algebra; he made the first systematic use of negative numbers in Europe; and published with attribution the solutions of other mathematicians for the cubic and quartic equations; and acknowledged the existence of imaginary numbers—a pretty significant biography for any scientist/inventor/writer.

But check this out.

Cardano was born illegitimately—the son of Fazio Cardano—himself a noted jurist and lawyer and a close paisan of one Leonardo da Vinci. In his autobiography, Cardano revealed that his mother—Chiara Micheri—had resorted to "various abortive medicines" to terminate the pregnancy. Upon birth, Cardano was taken from his mother. In labor for *three days*, just before his birth Mom had moved from Milan to Pavia to escape the Plague; her three other children died from the disease. Which, trying to cut her some slack, raises the question—is it possible Chiara wanted no part of another child lost to the Plague?

It gets worse. Despite enduring a depressing childhood—with frequent illnesses and a rough upbringing by his overbearing father—Cardano in 1520 entered the University of Pavia, studying philosophy and science. His bad luck continuing, war in Italy in forced the closing of the university in 1524. But Cardano continued his studies at the University of Padua, graduating with a doctorate in medicine in 1525.

However, Cardano apparently was possessed with an "eccentric and confrontational style" that did little to endear him with people. After his graduation in 1525, Cardano applied to the College of Physicians in Milan but was denied for reasons including his reputation and—his illegitimate birth. Nevertheless, apparently giving the devil his due, he was often consulted by members of the College of Physicians due to his uncommon intelligence. Cardano wanted to practice medicine where the money was—Milan, for example—but he was (of course) denied a license to practice. That led him to the town of Saccolongo, where he simply practiced without a license. It was there that in 1531 he married Lucia Banderini. Before her death in 1546, they had three children—Giovanni Battista (1534), Chiara (1537) and Aldo (1543). Cardano later wrote that those were the happiest days of his life.

Winning over the help of a few noblemen, Cardano taught mathematics in Milan. After finally receiving his medical license he practiced mathematics and medicine simultaneously. He ironically became one of the most sought-after doctors in Milan, and by 1536 he was able to quit his teaching gig. With his newly won celebrity in medicine, Cardano later wrote that he turned down offers from the kings of Denmark and France, and the Queen of Scotland.

As for his gearing contributions, Cardano's work with hypocycloids led him to what is known today as the "Cardan joint"—or gear mechanism—in which a pair of gears with the smaller being one-half the size of the larger gear is used converting rotational motion to linear motion with enhanced efficiency and precision; he is also credited with the invention of the Cardan suspension or gimbal.

Cardano was always short of money. What to do? He became a skillful gambler and chess player. His success led to his 1564 book about games of chance—*Liber de Ludo Aleae* (*Book on Games of Chance*)—which remained unpublished until 1663. It contains the first systematic treatment of probability—*as well as a section on effective cheating methods.* He rolled dice to understand the basic concepts of probability. Cardano also managed to publish two encyclopedias of natural science.

In 1570, Cardano was arrested by the Inquisition and lost his professorship. Upon his release he moved to Rome and received a lifetime annuity from Pope Gregory XIII.

Cardano was said to correctly predict the exact date of his own death. But, hedging his bets, he was ensured of being correct by—you got it—committing suicide.