

Girolamo Cardano

Today's subject is one of the most fascinating characters featured in this book.

What a movie his life story would make. He gained fame, or perhaps that should be notoriety, for being the most outstanding mathematician of his time, a physician, an astrologer, a scientist, a philosopher, a gambler, and a rascal. He has been described as a turbulent man of genius, lunatic, hypochondriac, perverted, dishonest, unscrupulous, pirate, indiscreet, quarrelsome, conceited, heretic, humorless, but capable of generosity, kindness and merciless self revelation. **Girolamo Cardano**



(September 24, 1501 – September 21, 1576), also known by the Latin version of his name Jerome Cardan, was born in Pavia in the Duchy of Milan. He was the illegitimate son of Fazio Cardano, a learned lawyer, and Chiara Micheri, an ignorant and quick-tempered widow with three other children, all of whom died in the plague. Fazio, whom Leonardo da Vinci consulted on mathematical questions, also taught geometry at the University of Pavia. Cardan's parents lived apart until he was seven, but married later in life. According to Cardan's famous autobiography *De vita propria liber (The Book of My Life)*, he was born only after numerous failed attempts to induce an abortion. He wrote that his early life was characterized by illness and frequent cruel beatings by his abominable parents.

As a sickly child, Cardan became his father's assistant, which meant from the age of four he was forced to carry Fazio's legal and medical books, as he visited his patrons. Some of these were strapped to his back, others he carried in his hands and still others on his head. Now and then, Fazio would refer to a book that he rested on his son's head. Cardan was studious and ambitious to escape his living conditions. After much dispute, his father agreed to send his son to Pavia University, where Cardan studied medicine. A notorious card cheat, Fazio was killed during a game in 1524. Looking for a means of supporting himself, Cardan became very successful casting horoscopes. When war broke out, Pavia University was closed, so he went to the University of Padua, completing his work for a doctorate of medicine in 1526, although the College of Physicians made several attempts to prevent him from receiving the degree. They used the excuse of his illegitimate birth to reject a man they considered to be a difficult, who aggressively and tactlessly advanced his unconventional ideas, with no concern for the consequences. To get even, he published a book, *On the Bad Practice of Medicine in Common Use* that proved very popular with the public, who had their doubts and suspicions about medical practitioners. Cardan practiced his

profession in Saccolongo, a small town located near Padua. He later recalled that the six years he spent there were the happiest of his life, observing: “I gambled, played musical instruments, took walks, was of good cheer and studied only rarely. I had no pains, no fears. It was the springtime of my life.” After being cured of impotence, which had afflicted him throughout his youth, he married Lucia Bandarini in 1531. They produced two sons and a daughter. They moved to Milan where things went so badly for them that they were forced to live in a poorhouse.

Their conditions didn't improve until 1534, when through the influence of friends of his father, Cardan became a teacher of mathematics in the “piattine” schools [founded by a bequest of one Tomasso Piatti] in Milan. This marked the beginning of his active interest in mathematics. In 1539, he published his first mathematical text, *Practica arithmetica et mensurandi singularis* (*Practice of Mathematics and Simple Mensuration*) and in 1545 produced his greatest mathematical work *Artis magna sive de regulis algebraicis liber unus* (*The Great Art, or the Rules of Algebra*), which is commonly called *Ars magna*. Its many new ideas in algebra were systematically presented. Among these is the rule, now called “Cardan's rule” for solving depressed cubic equations (that is, those that do not have a quadratic term). He also showed how to find approximation of roots of equations that could be calculated as close to the true ones as one cared to make them. He described negative numbers as “fictions” and their square roots as “sophistic”, and a complex root of a quadratic, which he had calculated, as being “as subtle as it is useless.” He was the inventor of imaginary quantities, by calculating with the square root of negative quantities in seeking methods to solve algebraic equations. Perhaps it took a man as eccentric as Cardan to investigate something that everyone else felt was absurd but is fundamental to the development of algebra and analysis.

Cardan had a lifelong passion for gambling and games, and although he was not a compulsive gambler, he had no desire to lose and didn't mind cheating if necessary. As a physician he often prescribed gambling as therapy for those suffering from anxiety and grief. Late in his life, during a stay in Bologna, he wrote *Liber de ludo aleae* (*Book on the Games of Chance*). It was published posthumously in his *Opera omnia*, ten volumes that appeared in 1663. The book, a century before the times of Pascal and Fermat, contained the first attempt to show that in gambling more than mere luck plays a role in the outcomes. He introduced the concept of probability and solved many problems relating to games of dice, cards, and knucklebones (an old game played with knucklebones of sheep).

Cardan continued to practice medicine and in 1539 he was admitted to the College of Physicians and soon after became rector. In 1543 he accepted the chair of medicine at the University of Pavia, where he taught until 1560. In 1562 he was appointed professor of medicine at the University of Bologna and before he was fifty Cardan was recognized as one of the most respected physicians in Europe, rivaling even the fame of the great Flemish anatomist Andreas Vesalius. Cardan became the first to give a clinical description of typhus fever. He described a tactile system for teaching the blind that was similar to that later developed by Louis Braille. He also thought it was possible to teach the deaf by signs, writing that the “sense of hearing and the use of spoken words were not indispensable to understanding ideas.” He experimented with a kind of code for teaching reading and writing to the deaf, but did not pursue it. He spent most of 1552 in Edinburgh treating John Hamilton, the Archbishop of Scotland, who was suffering from asthma. Since the bishop’s ailment was primarily nocturnal, Dr. Cardan suggested a change in the bedding, substituting silk for feather stuffing of pillow, mattress and blanket. That did the trick. Cardano’s medical advice included: “the studious man should always have at hand a clock and a mirror” – a clock to keep track of time and a mirror to observe the changing condition of the body. He helped people with tuberculosis, prescribing sound health programs, fresh air and exercise, establishing the principle of the sanatorium. Cardan developed the practice of physiognomy, the practice of trying to judge character and mental qualities by observing the horizontal lines at the top of a person’s forehead. These lines are interpreted in astrological terms, named from top to bottom, in the planetary order of Saturn, Jupiter, Mars, the Sun, Venus, Mercury, and the Moon.

Altogether Cardan wrote more than 200 works on a variety of subjects, besides mathematics and gambling, including: astronomy, astrology, physics, horoscopy, chess, consolation, marvelous cures, poisons, air, water, reams, urine, teeth, the plague, wisdom, morals, music, etc. His book on consolation inspired William Shakespeare to write Hamlet’s remarks on sleep and death in his famous soliloquy: “To sleep: perchance to dream: ay, there’s the rub: For in that sleep of death what dreams may come, ...” Among the titles of Cardan’s books were *De subtilitate rerum* (*The Subtlety of Things*), a collection of physical experiments and inventions, interspersed with anecdotes, and *Opus novum de proportionibus*, in which Cardan tried to apply quantitative methods to the study of physics. He invented the differential gearing, an arrangement of gears connecting two axles in the same line and dividing the driving force between them, but allowing one axle to turn faster than the other. Today it is used in the rear axles of automobiles to permit a difference of axle speeds while turning curves.

In 1570 the Inquisition imprisoned Cardan, accusing him of heresy for having cast the horoscope of Jesus Christ in his book *De astrorum iudiciis*, and attributing the events of Christ’s life to the influence of the stars. Another offense was a book he wrote praising the Emperor Nero, who had tormented martyrs. After spending a few months in prison, to gain his release

Cardan was forced to recant, abandon teaching, and refrain from writing books. The next year he traveled to Rome, where he was treated as a visiting celebrity and was immediately granted membership in the College of Physicians. Cardan won the favor of Pope Gregory XIII, who gave him a lifetime annuity. It was in Rome during the last year of his life that Cardan completed his autobiography, *De propria vita (The Book of My Life)*, in which he did not spare himself in giving a candid and revealing account of his strengths and weaknesses, triumphs and failures. Cardan admitted he was not saint, describing himself as “hot tempered, single minded, given to women, cunning, crafty, sarcastic, diligent, impertinent, sad, treacherous, magician, sorcerer, miserable, hateful, lascivious, obscene, lying, obsequious, and fond of the prattle of old men.” He predicted the exact date of his death, and to be certain that he was correct on the day in question he abstained from nourishment to help matters along in a kind of suicide.

Cardan’s reputation for dishonesty is traced to his relationship with mathematician Niccolo Fontana, better known as Tartaglia, “the stammerer.” It was customary at the time for mathematicians to challenge other mathematicians to solve various problems. When Tartaglia announced that he could solve depressed cubic equations, Cardan implored Tartaglia to reveal his method to him, swearing: “I swear to you by the Sacred Gospel, and on my faith as a gentleman, not only never to publish your discoveries if you tell them to me, but I also promise and pledge my faith as a true Christian to put them down in cipher so that after my death no one shall be able to understand them.” After much persuasion, Tartaglia revealed his secret to Cardan and was understandably shocked and indignant when Cardan published the method in the *Ars Magna*. Cardan justified his betrayal by writing: “Scipio Ferro of Bologna well-nigh thirty years ago discovered this rule and handed it to Antonio Fior of Venice, whose contest with Niccolo Tartaglia of Brescia gave Niccolo occasion to discover it. He gave it to me in response to my entreaties, though withholding the demonstration. Armed with this assistance, I sought out its demonstration in [various] forms. This was not difficult.” When Cardan discovered the solution of the depressed cubic in the papers of del Ferro, he no longer felt prohibited from publishing the result, giving credit where credit was due.

Cardan’s wife died in 1546. His daughter married his student and assistant Lodovico Ferrari. His oldest son, Giambatista, who had qualified as a physician, secretly married Brandonia di Seroni, a disreputable girl whom Cardan described as “a worthless, shameless woman.” The young couple moved in with her parents, but Brandonia and her family were only interested in what they could get out of Giambatista and his well-to-do father. She publicly taunted Giambatista for not being the father of their three children. When he could stand it no longer, he put arsenic on a cake and fed it to his wife and several of his in-laws. His wife died, he was arrested and confessed his crime. Cardan arranged for his son to have the best lawyers, but the judge decreed that to save his son’s life, Cardan had to satisfy the wife’s family. They demanded a sum that

Cardan could not meet. Giambatista was tortured in prison, had his hand cut off, and on April 13, 1560 was beheaded.

Cardan's other son Aldo was a scoundrel who associated with the lowest scum of society. Of course some might lay some of the blame at Cardan's feet. At about the time his older son was executed, Cardan fell into a fit of rage and cut off Aldo's ears for some unknown offense, a crime for which Cardan was not punished. Aldo not only gambled away all of his money and possessions, but he broke into his father's home to steal money to support his compulsive behavior. Cardan turned his son over to the authorities who banished Aldo from Bologna. Cardan removed his son from his will and left the bulk of his estate to his grandson, the son of his eldest son, whom he adopted after the death of the boy's parents.

Quotation of the Day: "Even if gambling were altogether an evil, still on account of the very large number of people who play, it would seem to be a natural evil. Thus it is not absurd for me to discuss gambling, not in order to practice it, but in order to point out the advantages in it, and, of course, the disadvantages, so they may be reduced to a minimum." – Jerome Cardan