

# Kepler's Witch



AN ASTRONOMER'S DISCOVERY OF COSMIC ORDER  
AMID RELIGIOUS WAR, POLITICAL INTRIGUE, AND  
THE HERESY TRIAL OF HIS MOTHER

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## Foreword

JOHANNES KEPLER is most often remembered for his venerable three laws of planetary motion, for which he has earned the title “the father of celestial mechanics.” But Kepler’s accomplishments were wide-ranging. In addition to acclaim for his laws of planetary motion, he is also considered the founder of modern optics. He was the first to investigate the formation of pictures with a pinhole camera, the first to explain the process of vision by refraction within the eye, the first to formulate eyeglass designs for nearsightedness and farsightedness, and the first to explain the use of both eyes for depth perception, all of which he described in his book *Astronomiae Pars Optica*. In his book *Dioptrice* (a term coined by Kepler and still used today), he was the first to describe real, virtual, upright, and inverted images and magnification (and he created all those ray diagrams commonly used in today’s optics textbooks), the first to explain the principles of how a telescope works, and the first to discover and describe the properties of total internal reflection. Galileo may have used the telescope that Johann Lippershey had invented to discover the moons of Jupiter and to see the first hints of Saturn’s rings, but it was Kepler who explained how the telescope works.

Kepler probably was the first real astrophysicist, as we know the term in the modern sense, using physics to explain and interpret astronomical phenomena. He was the first to explain that the tides are caused by the moon. In his book *Astronomia Nova*, he was the first to suggest that the sun rotates about its axis. He wrote what may have been the first sci-fi story, a view of earth from the moon. In his book *Stereometrica Doliorum Vinariorum*, he developed methods for calculating the volume of irregular solids that became the basis of integral calculus. And he was the first to derive the birth year of Christ that is now universally accepted.

Today when we think about scientists, we have images of university professors in ivy-covered halls, laboratories full of elaborate instruments, cadres of graduate students, laptop computers more powerful than all

## Foreword

those used to send men to the moon, and large government grants. Yet with all of these resources, how much of today's research will stand the test of time the way the works of Kepler have? Much has changed in four hundred years, but Kepler's laws are as exact now as they were then. How was he able to accomplish so much? Actually, given the times he lived in and the meager resources, how was he able to accomplish anything?

Context is the window to understanding. To understand Kepler and his accomplishments, one needs to understand the times in which he lived—the culture, people, places, politics, religion, and his family. Wars, witch hunts, pestilences, and death were common everyday occurrences. The potions that people used as cures were a far cry from today's medical miracle drugs. *Kepler's Witch* communicates a feeling for the hardships, difficulties, rejections, loneliness, and heartbreak that Kepler endured. He lived on the verge of poverty. His salary was almost always in arrears. His only resources were paper, pen, and one man's treasure trove of astronomical observations.

What drove Kepler? What sustained him? How could he endure? It certainly wasn't the money or even glory. He had few peers who even recognized his accomplishments. In *Kepler's Witch* readers get a feeling for the source of his strength, his vision, and his perseverance, how he was able to do so much with so little in spite of all the evils that surrounded him in life. Kepler believed in an almighty God, the creator of heaven and earth. He believed in Jesus Christ as personal Savior. He believed in the ideal of the holy catholic (universal) church. Kepler was a man of peace in search of harmony—in particular, the harmony of the heavens. Somehow he knew it was there, even if life on earth was far from harmonious.

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\*The Kepler Mission is a special NASA space mission for detecting terrestrial planets—that is, rocky, earth-sized planets—around other stars. It is scheduled for launch in 2006.



## *Introduction: So Why Kepler?*

AFTER HAULING MY STACK OF LUGGAGE down the platform, I finally came across the last unclaimed seat on the night train from Stuttgart to Prague. Since no one shooed me away, I heaved my luggage into the upper bins and collapsed into the seat. Beside me were two Italian men who pretended to be asleep. Opposite them by the window was a blond German woman with a sack lunch on her lap. Beside her, in the middle seat, was a Korean boy, taller and lankier than I expected. He was traveling around the world, and in his broken English he said he wanted to know everyone's story. Across from me was a short, unnaturally thin German student with a buzz cut and an excess of earrings, sitting wound into himself in a sort of existential fetal position. I was not surprised when he pulled out a packet of cigarette papers and rolled his own.

"You an American?" he asked.

"That's right."

"So what are you doing in Germany?" he went on, as if I alone had no right to be there.

"I'm writing a book about Johannes Kepler."

"What makes you think we want to know what you have to say about Kepler? You cowboy Americans and your cowboy wars. How many people have you killed this week?"

## *So Why Kepler?*

He watched me, waiting for me to bite. I wanted to explain to him about World War I and World War II, but I didn't think this was the time. "Well, we were attacked, you see," I said finally. "I was just across the river in Jersey at the time, so I saw it myself. So don't talk to me about our 'cowboy wars.'"

The temperature in the compartment dropped considerably. People fidgeted and looked at one another nervously, wondering if there was going to be a shouting match. Discussing American foreign policy is only pleasant under the most controlled conditions, especially since I didn't agree with the policy myself, though I wasn't going to tell him that. The student leaned back in his seat, muttered "cowboys," and pulled out a well-thumbed pocket edition of sayings from the Qur'an. For the next two hours, the trip rolled along pleasantly enough. The Korean student talked about his hometown and then all about the countries he had traveled through, counting them all on his fingers. The Italian men said they both came from Belluno, a city just north of Venice. The German woman spoke briefly, in German. One of the Italian men translated for the rest. She was on her way to visit her son, who was staying with his father, her estranged husband, who was in turn staying with his mother. Though they were not divorced, she worked and lived in Frankfurt, and her husband lived in a little town outside Berlin.

Suddenly, the student tucked his copy of the Qur'an back into his pocket and cocked his head at me.

"So why Kepler?" he said.

I looked at my shoes and thought about how to answer him. After a while, I looked up and said, "Because in 1620 Kepler's mother was being tried for witchcraft. Germany was well into the Thirty Years' War. Kepler had already lost his first wife and little boy to disease, and in the years following he lost three more children. In his adult life, he was chased out of one town after another by the Counter-Reformation. He was excommunicated by his own church. And yet, throughout most of these years he was writing a book called *The Harmony of the World*. This," I said, "is a man worth knowing."

The German student eyed me and sucked on his cigarette.

Since then, I have thought a good deal about this question. Great people show up now and then in this world. What makes them great is complicated. Some say Kepler was a genius, which he certainly was, but his scientific intelligence was not the source of his greatness. Johannes Kepler was one of the most powerful scientific minds of his century—he was an equal to Galileo in almost every way, a precursor to Newton, a man who had done the spadework for most of the important discoveries that defined science in the seventeenth century. And yet Kepler was also great in the way Gandhi and Martin Luther King, Jr., are great. He was a man who fought for peace and reconciliation between the Christian churches, even when it nearly cost him his life. Some people are born to greatness; some are made great by the events of their day. Some, such as King, Gandhi, and Kepler become great because they make choices full of moral courage. Kepler was a believing Lutheran and would never become a Catholic, even when it would have benefited his career to do so. People all around him were jumping from one church to another. Kepler's father-in-law did it. So did many of his acquaintances and rivals, simply to better their political or social position or not lose their earthly possessions. But Kepler believed in the Reformation; he believed in it with his soul. He stood fast with the Lutheran church, even when that church excommunicated him. When the Counter-Reformation chased the Lutherans out of their homes, he went with them, all the while fighting with the leaders of his own church in order to maintain the integrity of his conscience.

This book is a response to the question that the German student posed so succinctly—“Why Kepler?” Kepler is the man who finally confirmed Copernicus. He made a first, close attempt at defining a law of gravity. But above that, he was a man who contemplated in mathematics the glory of God. His life, his work, his mathematics were always about God. Everything he did was about God. Kepler found God in the hidden mathematical harmonies of the universe in as deep a way as he found God in the revelations of Scripture.

This is a man worth knowing. This book places him in his world, in his faith, in the events of his day. So why is Kepler not better known in our world? Everyone knows Galileo, even if all they know is that he was the

## *So Why Kepler?*

guy who fought with the pope. Most people at least know the name Copernicus and that he had something to do with a revolution. They know Newton as the guy who had an apple fall on his head. But many Americans do not even know Kepler's name; it's as if he has been written out of the history of science. The National Air and Space Museum in Washington, D.C., has almost nothing about him. Why? Kepler was, as author Arthur Koestler called him, the "watershed" where the medieval world finally gave way to the modern. After Kepler's time, the scientific movement codified its method, largely following the lead of Newton's *Principia*. Newton, whether by accident or design, kept his own personal thoughts and mystical speculations, of which he had many, out of his scientific writing, a practice that later became the model for the scientific mind-set—distant, observing, uninvolved.

After the death of Tycho Brahe, Kepler and Galileo were the preeminent astronomers of their day. If Galileo was the great observer, Kepler was the great theorist, and yet their relationship was not overly cordial. I suspect that some of this came from the fact that Kepler was a Protestant and Galileo was a Catholic, and despite all the astronomical ties that bound them together, that religious difference kept them apart. Both men suffered for their religion. Both men helped to fashion the scientific world. And yet Galileo has come down to us through history as the martyr for science, while Kepler has been treated by some as a sort of embarrassment. This is largely, I believe, because Kepler did not wish to separate his science from his metaphysics or his metaphysics from his mysticism. He could not therefore fit the profile of the perfect scientist as it formed itself in the century after his death. Kepler did not have enough scientific cool—neither did Galileo or Newton for that matter, but when mythologies fashion themselves, such things don't matter.

This mythology that gathered around Newton and Galileo, this pseudo-history, pictured the scientific method, the method of the plodding empiricist, as free of metaphysical speculation and exploding from the heads of these two men, entire. But in truth, real history is always much more complicated than myth, and men like Kepler, sometimes forgotten, played a bigger role than the myth would allow. In my grumpier mo-

ments, I suspect that Galileo has been given his part in the myth because he fought with the pope, which made him a scientific Hercules. In my less grumpy moments, I suspect that there is some truth to the myth, because Kepler's mind, as it appeared in his work, was far-ranging. Was Kepler a scientist, a philosopher, or a theologian? The answer is yes to all three. Scientific work for Kepler was always grist for his theological mill, a chance to praise God.

In some ways, the whole problem comes down to Newton, who either by accident or by intent failed to give Kepler the credit he deserved. And some of Newton's own friends and supporters, including the Scottish astronomer David Gregory and the English astronomer Edmond Halley, of the comet fame, chided Newton for not giving Kepler proper recognition.<sup>1</sup> I suspect that Newton, the archeotist, in his darker moments knew quite well what he owed to Kepler, who had brought him right up to the doorstep of his theory of gravitation, who had laid the foundation for his work on optics, and who, as Leibniz recognized and Newton dismissed, had set the stage for the invention of calculus. He knew what he owed to Kepler but would not acknowledge it.

But this seems almost too appropriate to the rest of Kepler's life. He was a man caught between the grinding wheels of history, not only religious history, but scientific as well. In the last part of his life, he struggled through the first years of the Thirty Years' War, the war between Christians in which Reformers and Counter-Reformers tore at the body of the faith. Everyone suspected everyone, and Kepler, who would not abandon his own beliefs, suffered excommunication from his own Lutheran church on the basis of those suspicions. Sadly, much the same thing happened to him after his death at the hands of the scientific community.

If I have any *mea culpas* to make in this book, one is this—I did not try to give an account, except as a sketch, of Kepler's science. There are many great books about his science, and they are listed in the Source Readings. Read them, for they are more than worth the effort. This book, rather, is about Kepler's life, about his suffering and his triumphs. Perhaps if you read this book, knowing Kepler will make your own life work a little better.

## *So Why Kepler?*

I have alternated the chapters in *Kepler's Witch* with translations of Kepler's letters and journal entries. They tell the story, in Kepler's own words, of the crises he suffered. The best part about studying letters is that you find that great people in history are no longer legendary figures, but ordinary human beings caught in mundane torments. In studying Kepler, I found that all of his discoveries were made against deep opposition and were the result of tenacity. He never achieved anything easily.

The translations are keyed to the main events in Kepler's life. Some of these events are complex, for they span the length of Europe and sometimes cover a period of a century or more. This makes the translations crucial to the story. But more important, far too little of Kepler's writing has been translated into English. Mind you, a network of scholars has over the years translated most of his greater scientific works, usually from Latin, but the kitchen details, the facts of his daily existence, have been left out.

Still there have been some marvelous, informative biographies of Kepler, most notably the one by Max Caspar entitled, prosaically, *Kepler*. Every Kepler biographer owes mountains of gratitude to Caspar, and I am no exception. With the help of Martha List, Caspar collected and edited all of Kepler's sundry writings, from his scientific work to his letters to the account of his mother's witchcraft trial. This gigantic library-sized collection is still in print, and I bought a good chunk of it myself. It is called *Johannes Kepler Gesammelte Werke*, referred to in the notes as *GW*. As often as I could, I returned to the *GW*, ferreted out the original German, and translated it myself. But translating it into readable modern English was not always easy, for several reasons. Kepler wrote in both German and Latin. His Latin style was impeccable, but his German, though his native tongue, was not very good, often florid and overly ornate. In addition, he wrote in what is now called *Frühneuhochdeutsch*, a transitional form of German that is neither medieval nor modern, a form that evolved quickly into later variants that in turn evolved into modern German. It is only now being recovered by scholars.

All of this to dig out the life of a man worth knowing. The rest of that train trip, the German student and I talked about Kepler. When he left the train, he shook my hand and said, "Good day." A beginning.

LETTER FROM KEPLER TO THE SENATE OF LEONBERG  
JANUARY 1, 1616



*Earnest, caring, wise, and especially benevolent Gentlemen, to whom I am devoted to the best of my ability:*

*I wish you a joyful new year.*

*On December 29, with unspeakable sadness, I read a letter my sister, Margaretha Binder, sent me dated October 22. As I understand it, there is a case before you concerning several people accused by the court, based purely on the imaginative ranting of your dear darling housewife and sister, Ursula Reinbold. Everyone knows that until this day, this woman has lived frivolously, and now, according to you, she has become mentally ill. Caught in the middle of this depressing web of suspicion, my own dear mother, who has lived honorably into her seventieth year, has been accused by you of giving this same crazy person some silly magic potion, which you say caused her insanity.*

*But apparently even the dung heap of suspicion, slander, and gossip that these people have been spreading around town has not been enough. These same people have let themselves be blinded by the devil, the master of all misunderstanding, superstition, and darkness, and have let themselves be deceived. Forsaking God, they thought they could help their dear darling kinswoman by enlisting the aid of the devil. They forced my poor mother to perform some stupid, superstitious magical ritual, a ritual that they would have you believe was meant to assuage their fear and terror of the accused person,*

*namely, my poor mother. As you know, this use of witchcraft against witchcraft, a superstitious cure at best, is highly illegal. This is well known among the jurists, who widely reject it as a pactum tacitum cum diabolo, a tactical pact with the devil, and therefore an ungodly remedy. Indeed, many of you would consider it an indicium ad torturam, an indication for torture, if an accuser were to choose such a course and afterwards claim that the devil was conjured during this highly dangerous procedure against innocent persons, all because of this superstitious ritual.*

*I am writing not only in reaction to my sister's letter, but also in reaction to word from other trustworthy sources whose reports break my heart. My own dear mother, in her old age, has been more and more abandoned by time, and now they tell me she is to be dishonored and stripped of her possessions? Also, secretly, her son, my own brother, is to lose his estate as well? I have also heard that my mother was threatened with prison by the local constabulary and strongly urged by men who were armed when they questioned her, as if they meant to kill her on the spot, but still she resisted. Finally, these men used kind words and deceitful promises to persuade a poor old woman, making her think that nothing would happen to her. They used every other devilish trick you can imagine, demanding that she perform this forbidden ritual, supposedly to help the crazy woman, Ursula Reinbold, whom she did no harm to in the first place and could not help. From what I have heard, after she finally performed the ritual demanded of her and cured the woman, you claimed that this was done with the help of the devil's magic. So now, they say, my mother deserves the death penalty, when in fact the people who forced her into such actions deserve it more.*

*In summary, it is not surprising to me that this whole situation has left my mother feeling very afraid and unjustly at-*



tacked. All she wanted to do was to save her life, to still her grief, and to appease her accusers by giving them what they wanted, even though the blessed Almighty forbade this. Because of this, she was sentenced to torture by a judge who is not very knowledgeable in the law, and she could have suffered a terrible death. So, even when God has mercy on a sick woman and lets her regain her health, these devils would use this blessing to slander my mother's good and honest name as if they had driven a knife into her neck. And these same fiends would leave my poor, innocent mother with the feeling that they had actually helped her by first instilling fear in her, and then, by using the above mentioned superstitions, banned one devil with another.

Now as I understand from my sister's correspondence, both her landlord and her brother, who also endured this demonic injury and this terrible danger, are to be charged in a jury trial! This was a warning for me. Though it was carelessly mentioned in my sister's letter, other people have advised me as well that two legal actions have already been put forward. I do not know if my name appears on the list of the accused, or if they plan to include claims on my assets or income. I do not know if I will need to secure my holdings and my good name, in case these may be jeopardized, particularly if the accusers want to claim that I too practice the forbidden arts. I have no idea if this ridiculous situation, which has been blown all out of proportion, will also blow away my fifteen years of imperial service. This would break my mother's heart entirely (which is, of course, my chief concern, far more important to me than any of my personal sorrows).

Based on this and because of my dual interest, I address the honorable court with my well-founded request to immediately forward to me copies of all documents received by the court from both sides to date. My own courier will bring the

*documents to the Cantstatt Post Office, where they have orders to forward them to me in Prague, where, if my health allows, I will apply for permission to travel to my home.*

*In the meantime, I want to respectfully remind and request that right honorable, wise, and steadfast Gentlemen give my cause the attention it deserves, so that the law can follow its proper course with due process. Although these are my kin who are accused and not I (doubtless though we have the same name), I want to have my protest noted, and that nothing be omitted, so that my judgments about the case might be considered, granted, and approved or contractually engaged. I also desire that all judgments rendered against either party, to the limits of the jurisdiction of Leonberg, take account of my rights and obligations, which I have not surrendered. Rather, I maintain those lawful rights for the sake of my deserving, widowed mother, a law-abiding and commendable woman, and because of my desire to protect her and her assets. Let it be known that I will also seek the help of my friends and mentors, and that I will gain favors from such well-known and respected persons as I am acquainted with. I intend to contest this matter and bring to bear the full extent of my powers until it is finally remedied in accordance with the written laws.*

*Herewith, right honorable, provident, and wise, especially gracious Lords, putting myself and my kin into your protection and awaiting the necessary action.*