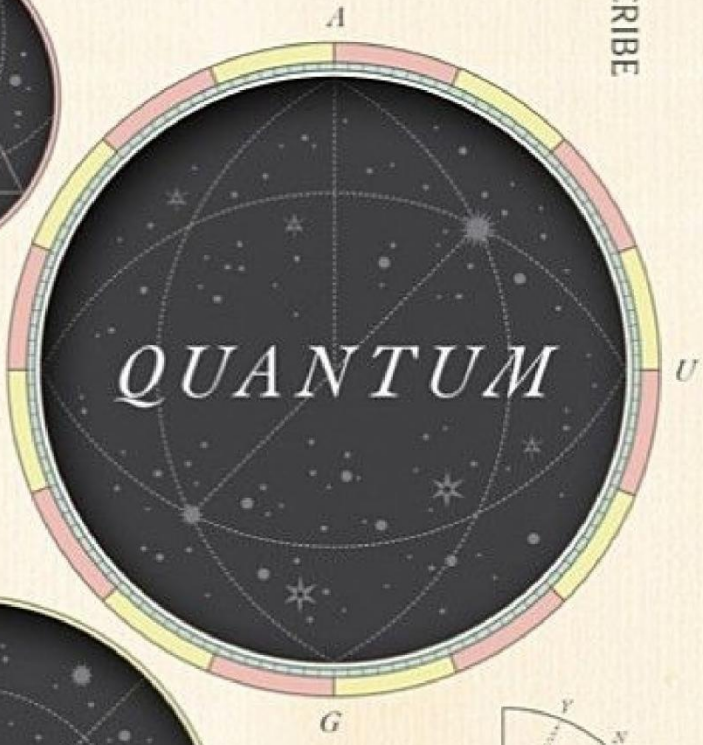
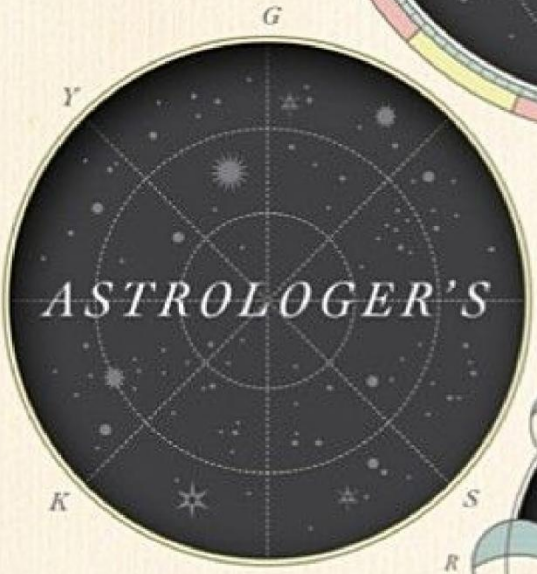
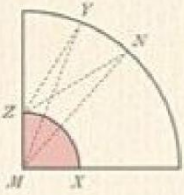
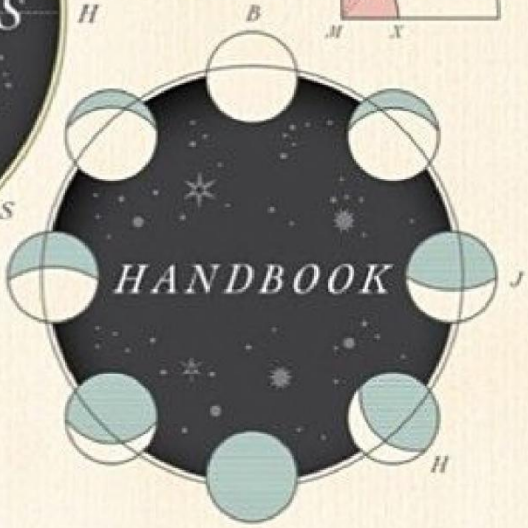
SCRIBE

The QUANTUM ASTROLOGER'S HANDBOOK





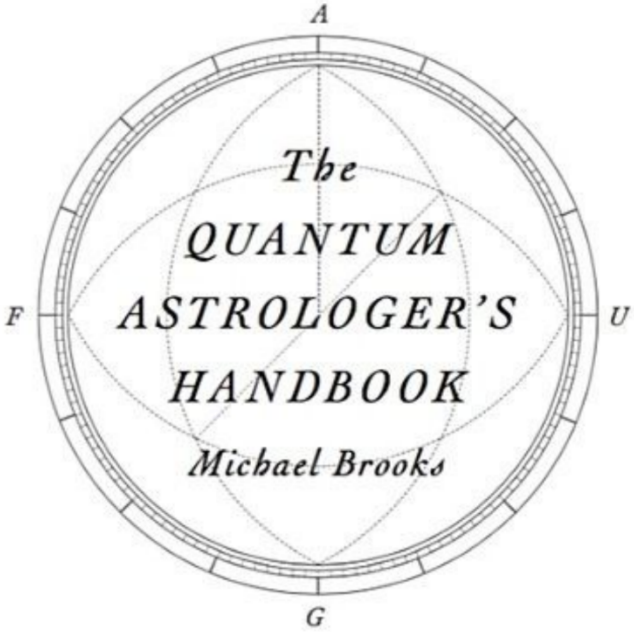




Michael Brooks

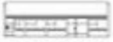
Contents

Michael Brooks, who holds a PhD in quantum physics, is an author, journalist, and broadcaster. A consultant at *New Scientist*, he also writes regularly for *New Statesman*. Brooks is the author of *At the Edge of Uncertainty*, *The Secret Anarchy of Science*, and the bestselling non-fiction title *13 Things That Don't Make Sense*. His writing has appeared in *The Guardian*, *The Independent*, *The Observer*, *THE*, *The Philadelphia Inquirer*, and many magazines. He has lectured at, amongst others, NYU, the American Museum of Natural History, and the University of Cambridge.



The QUANTUM ASTROLOGER'S HANDBOOK

Michael Brooks



Scribe Publications
18–20 Edward St, Brunswick, Victoria 3056, Australia
2 John St, Clerkenwell, London, WC1N 2ES, United Kingdom

First published by Scribe 2017

9781925322408 (Australian paperback)
9781911344407 (UK hardback)
9781911344520 (export paperback)
9781925548280 (e-book)

CiP records for this title are available from the National Library of Australia and the British Library.

scribepublications.com.au
scribepublications.co.uk

I was ever hot tempered, single minded, and given to women ... cunning, crafty, sarcastic, diligent, impertinent, sad and treacherous, miserable, hateful, lascivious, obscene, lying, obsequious ...

JEROME CARDANO

Cardano was a great man with all his faults; without them he would have been incomparable.

GOTTFRIED LEIBNIZ

Prologue

It is 6 October 1570. In England, Guy Fawkes is a newborn baby in his mother's arms and Queen Elizabeth I is feeling the sting of her excommunication from the Catholic Church. In Italy, the once-great Jerome Cardano, now sixty-nine years old and feeling it, is also about to fall foul of the religious establishment.

He is in Bologna for a meeting of the city's syndics, the governing officials who pronounce on civil law. Jerome hopes to persuade them of his innocence — that he has not, as the Milanese College of Physicians has suggested, committed sodomy and incest. Forbidden to enter Milan to plead his case, his only hope is the Bolognese syndics. But his hope is misplaced and he seems to have no concept of just how impossible his position has become. In the public's eyes, he is now a madman. In Milan, he was spotted begging for alms at the gates of the College of Physicians — where he once held the office of rector. There are moments when Jerome is overcome by his new misfortune, by his hunger, and by the ignominy of his position, and is found loudly cursing in the streets. It doesn't help that he has taken to wearing a gift given to him many years earlier by the Archbishop of Scotland: a belted plaid that he wraps around his waist and secures with a leather belt, throwing the rest of the heavy mottled cloth over his shoulder. No one in Italy has ever seen — let alone worn — anything quite like it. Who can blame the locals for laughing?

How the mighty fall. Just two decades earlier, this man was

summoned all the way to Edinburgh to treat the Archbishop's asthma. On his long journey to Scotland, the physicians to the French king had organised for Jerome to speak at a series of conferences in Paris. Then, while in Edinburgh, the courtiers of the young King Edward VI of England had begged him to come to London and provide a medical consultation for the ailing royal youth. Not satisfied merely to tap Jerome's medical skill, they prevailed upon him to construct the royal astrological chart. He left Edinburgh a rich and celebrated man; he left London even richer. On his journey home, he travelled via all the major cities of Europe, entertained by noblemen and the ambassadors of the Holy Roman Emperor.

Now he has no money to pay for lodgings and spends his nights in an abandoned hovel where the wind whistles through the gaps in the walls. What is left of the roof creaks ominously above his head. Every evening, before he goes to sleep, the celebrated physician, the royal astrologer, the inventor of numerous machines and mathematical abstractions — among them probability theory — eyes the rotten beams. He attempts a calculation of the likelihood of the building's collapse. There is a part of him that would welcome such a swift end.

But morning comes and the building still stands. His stomach empty and groaning, Jerome emerges warily into the light and looks down the street. He has woken in a good mood. There is a lightness in his stride as he sidesteps a mangy, sleeping dog — he has developed a phobia of dogs that he will attempt to explain in the pages of his autobiography — and turns towards the city centre. Today, he will see the Bolognese syndics and they will listen to him. These are not like the petty, sour-faced goats that rule over

Milan. From tomorrow, he will be permitted to earn his living again. And then, across the road, he sees someone staring at him. At first, the disfigured, bearded features of Nicolo Tartaglia are not clear. But then the man known as The Stammerer steps forward, and with him steps a cohort of the city guard, their armour gleaming in the early morning sun.

'There he is,' Tartaglia says. His words are barely discernible, so profound are the childhood injuries to his face. But the gleam in his eye is unmistakable. 'Arrest him.'

As the guard moves to cross the street, another figure is revealed. Watching with a cold, intense gaze is Aldo, Jerome's youngest son. Slowly, the young man turns and walks away. But not before the father sees a sly smile, a grin that celebrates a long-sought revenge, bloom on the face of his only surviving child.

ψ

Have you ever wanted to understand the universe? Once that desire burns away at your soul — really burns — there's no going back. That's why some people dedicate their lives to physics. Or to philosophy. Or to Buddhism. Or to mathematics. They are all searching for answers. I am not saying that they are all ultimately following the same path — I know which I think is the best bet — but none is able to satisfy everybody.

I chose physics as my path to enlightenment. Some prefer the teachings of Jesus. Others go for Krishna or Kabbalah. My friend Jerome Cardano — indulge me, for we have spent a lot of time together — opted for astrology. He didn't ever really trust it, though. Jerome used to worry at astrology, to work it hard, to ask difficult questions of it. I'm not convinced everyone does the same, even with physics — a predicament

that provides much of the reason for this book.

I am a physicist. My expertise, such as it is, is in quantum mechanics, the theory that describes how the world works on microscopic scales. My interest in Jerome arises from the fact that he used his sharp mind to unearth the mathematical pillars on which quantum theory, our most successful scientific guide to the universe, is founded. Astrology and quantum physics rattling around in one Renaissance skull — who'd have thought?

Jerome would be happy that I am introducing him to you: his work, his mind, and his life. He always wanted to be famous; by the age of twelve, he had decided to dedicate himself to creating something that would bring him lasting renown. That you know next to nothing about him points to one of his many dashed hopes.

He hoped also to make his fortune at the gambling table. Despite inventing probability theory for just that purpose, he gambled away his marital bed and all his wife's jewellery. Then there was his hope that his wife, Lucia, would live a long and happy life. For all the good doctor's successes in treating others, he could do nothing to halt her death after just fourteen years of marriage. He hoped that his elder son would be a successful physician. Unfortunately, Giovanni's marriage into a family of gangsters made that particular aspiration particularly optimistic, and the young man's execution for murder, a plot twist that broke Jerome's heart, put an end to that hope. Jerome also hoped for grandchildren, but ended up raising only the grandchild of a man who tried to ruin him.

The one thing for which he held no hope was probably his most important and lasting creation. It is the square root of a negative number, something we now call the imaginary

number. Though it initially seemed like nothing more than a strange mathematical abstraction, it has turned out to be essential to understanding how the universe holds together.

It was a privilege to be the one to tell him.

You're probably thinking that I have lost my mind. You might be right. My obsession with Jerome has, in the last few years, taken me over. I have a mind that has been schooled in quantum physics and trained to think rationally, dissecting facts and ideas dispassionately. And here I am, not only celebrating a Renaissance astrologer, but talking as if we are contemporaries.

To me, though, it makes sense. I talk to Jerome. He talks to me. These conversations take place in my head, true, but they are informed by his writings, and by things written about him. We are intellectual contemporaries. We are both rational, both seeking to understand the universe, both convinced that nobody has a good grasp of it yet. We both believe that space and time — time, in particular — are not what you and I have been raised to believe they are. So, yes, this book is not quite what you have come to expect from a science writer with my training and history. But I can't help that. In my head I have visited Jerome in his prison cell. And maybe it is not just in my head. Within the books that Jerome wrote after his release I see unmistakable traces of my visits.

Perhaps you should walk away before I drag you into this madness.

Chapter 1

Jerome has been in this cell for eleven weeks since his arrest. The weather has turned cold and damp, and he struggles to keep himself warm. Until yesterday, he had no idea why he was in prison; no one would tell him anything. The hunched man who brings fresh straw every day refuses even to look at him. The tall, thin boy who brings the food smiles as he sets the bowl down on the writing desk, but has nothing to offer but a shrug in response to Jerome's questions. Yesterday, though, a new face entered the cell. When the guard turned the key and opened up the door, the stranger took one step in, threw down the yellow robe, smirked, turned, and walked away. And then Jerome knew.

He puts down his pen and turns his attention to the robe that now smothers his emaciated frame, pulling at it as if it burns his skin. It is embroidered with demons who are using forks and fiery flames to torture hapless, grimacing men. Jerome knows its significance: it is what the heretics wear when led to the stake.

We are in December now. Christmas is coming and the last light of the day is fading ever earlier. The cell is small and dark, with a window big enough only for a small boy to climb through. It has been many decades since Jerome was a small boy. He is sat behind a rickety desk — a small mercy afforded to him by the authorities. Perhaps they hope he will write more blasphemies and make their case easier to prosecute.

Jerome looks up from the robe and stares at me through the gloom. He is not sure if I am an apparition. I am not sure,

either. Eventually, without shifting his gaze from my eyes, he puts his fingers to his mouth and pulls out a small emerald. It is held on a chain around his neck. He lets the stone fall to his chest.

'Do I know you?' he says. His voice is thin and high pitched — reedy — entirely unbecoming to a man in his seventh decade.

'I don't think so,' I say.

'Did they send you to spy on me?'

'They?'

'My Inquisitors.' He pulls at the yellow robe again.

'No.' I break from his gaze and survey the cell again. 'I'm just here. As far as I can tell.' It is all I have to offer.

It seems to satisfy. 'Oh,' he says. He picks up the pen again. 'Well, welcome, then.'

'Are you writing to Archbishop Hamilton?' I say.

He stares at me. 'Why would I do that?'

'To ask for his help.'

Jerome shakes his head. 'He will be dead by now,' he says. 'I'm sure of it.'

I have read the history books and I know the truth. 'He's not. Your treatment was more successful than even you might have hoped.' I hesitate, unsure whether this constitutes some breach of the rules of engagement. I decide I don't care. Nobody has told me the rules. 'You should write to him,' I say.

And that is how, I like to think, I came to save the life of Jerome Cardano.

ψ

It is going to be difficult to convince anyone that I saved Jerome. Jerome was born in 1501 and I in 1970. Bound as we

all seem to be by time's arrow, I can see that there are problems with the concept. I may already be coming across as an unreliable narrator. But, before you judge, first learn something about where I'm coming from and — more importantly — familiarise yourself at least a little with the ideas of quantum theory.

According to our best description of the atomic and subatomic world, atoms and their constituent particles are able to exist simultaneously in two places at once. It's there in the theory and we've seen it in experiments. They can even exist at two different moments simultaneously. So, even as they gather to form my body, their notion of time and space is utterly different to the one I experience. And so, I ask, why shouldn't I be in two places and epochs at once?

I'm playing with you, of course. I *am* an unreliable narrator. That's the whole premise here. But aren't we all? After all, I've already mentioned my 'experience' of time as if I know what that means. All I can tell you about that particular phenomenon is that my experience involves my consciousness — something that scientists can't even define, let alone explain. If quantum physics is slippery, it's nothing compared to the minimal friction you'll encounter when you try to pin down a neuroscientist on consciousness.

One of the problems is that consciousness is entirely subjective. I believe I am conscious; I have no way of telling whether you are. You, to me, are therefore an unreliable narrator. A narrator is only reliable when we can corroborate their version of events. We take the view that if several people agree on a narrative arc, it is probably a trustworthy description of how things happened. But how can I trust anyone else if I don't know what's going on — if anything — in

their head? What's more, it doesn't mean that other things — things no one mentioned — *didn't* happen. Even the agreed narrative may not tell the whole truth.

I certainly cannot corroborate Jerome's version of events. I can only go by what he says — and what he says is sometimes odd. I first came across him some years ago now, when researching a book about how science works. I was writing a chapter about the origins of scientific creativity and was seeking out examples of strange sources of inspiration: hallucinogenic and dream states, daydreams or poetry-inspired visions, and so on. Most scientists chose to hide these questionable sources. But not Jerome.

He invented the mechanical gimbal that was to make the printing press possible. His idea led to the 'Cardan joint' that takes the rotary power in the driveshaft of your car's engine and allows it to be transmitted to the front and rear axles. We have already mentioned the mind-bending imaginary numbers that are multiples of the square root of -1 and the original mathematics of probability. He pioneered the experimental method of research in areas as diverse as medical cures for deafness and hernia, cryptography, and speaking with the dead (forgive him, these are not strictly scientific times). Jerome's autobiography details some of these achievements, yet when he documents their source he says they came from 'the ministrations of my attendant spirit'.

Here we would say he is indulging in unreliable narration. We tend not to believe in visiting spirits, especially those that impart scientific insights. So this is surely a lie, or the raving of a disturbed mind? Jerome's father also had a spirit visitor, as it happens. As a trained scientist, I should probably put all

this down to a genetic predisposition to psychosis or schizophrenic delusions. Yet despite, or perhaps because of, this I became quietly fascinated. I read everything on Jerome that I could find. The vast majority of his four million words of writings (four million!) are only available in Latin (not my strong suit), but there are a few biographies in English. A couple were written in the nineteenth century. A Norwegian mathematician called Øystein Ore published another in 1953, focused on Jerome's probability work. There's a more general biography from 1969, written by a jobbing journalist called Alan Wykes. More recently, some academic scholars have dissected Jerome's astrological studies and his medical work. All this seeped into me, permeating my thinking and my imagination, and mixing itself with my experience and my knowledge. Then it set hard in my brain as thoughts and imaginings about the possible, the probable, and the unlikely. It became a new narrative for me, as compelling as quantum theory and just as unreliable. Jerome and I are now inextricably entangled across space and time, just like the photons that spooked Einstein so badly.

Photons, I should explain, are the fundamental particles of light and other radiation. They travel at — unsurprisingly — the speed of light, which is the maximum speed of anything in the universe. In his special theory of relativity, Einstein showed that travelling at the speed of light is equivalent to halting time. That means photons do not experience time, as such. However, that didn't stop him balking at entanglement, arguably still quantum theory's most shocking revelation.

This is the discovery that you can cause two photons (or any other quantum particles) to interact so that their properties become shared between them. You can then