

Title, author
and publisher
(and price)

Allen Lane £20

Physics of the Impossible, By Michio Kaku

Precognition may not be possible, but a speculative physicist can predict a future of teleportation and starships

Reviewed by Doug Johnstone
Sunday, 6 July 2008

One-sentence
summary of
topic of book

Michio Kaku doesn't know the meaning of the word "impossible". Or rather, to be slightly more accurate, he has redefined the term to enable him realistically to examine and predict the future of science and technologies, from teleportation and time travel to robots and starships.

If this sounds like wild speculation, well, that's half right – it's certainly speculative, but it's far from wild. Kaku is well placed to try to imagine what developments might possibly occur in the fields of science and technology over the coming years, centuries, millennia and aeons.

Author's
credentials and
prior work

He is an esteemed theoretical physicist and one of the world's leading authorities on string theory (essentially an attempt to discover a "theory of everything" combining all of the known physical forces), and he also specialises in future science, having presented several television programmes on the topic, most recently the BBC4 documentary Visions of the Future.

Description of
contents of
book – first, a
summary of
what's
covered.

Handily, for those of us not au fait with the process of speculating on the future of physics, he's split his impossibilities into three categories. Class I impossibilities are technologies which are impossible today, but don't violate the known laws of physics. Kaku reckons that these impossibilities – including things such as teleportation and psychokinesis – might be possible in some reduced form sometime within the next couple of hundred years.

Class II impossibilities such as time machines and hyperspace travel are at the very edge of our scientific understanding, and may take millions of years to become possible. And the trickiest of all, Class III impossibilities, are technologies which break the laws of physics as we know them. Surprisingly, there are very few of these, and Kaku only examines two, perpetual motion machines and precognition (seeing into the future).

Reviewer's
commentary
on contents of
book.

If this all sounds like pie in the sky, think again. After all, how would physicists 200 years ago have reacted if you'd told them about the internet, the atomic bomb or the moon landings? What would they have made of Einstein's theory of relativity?

What this book amounts to, in effect, is a serious look at the science behind all the crazy futuristic ideas that have been cropping up in science fiction over the years. Indeed, there are so many references to Star Trek and Star Wars scattered throughout this entertaining journey, that you sometimes wonder if physicists just spend all their time watching old sci-fi re-runs and trying to work out how to recreate the technologies included in them.

Reviewer's judgment: mostly positive, but note that there are some critical points.

That's not to say that *Physics of the Impossible* is far-fetched. Kaku is very careful to present his cases in terms of recent scientific and technological developments where possible, and for the most part he is a clear and engaging writer, able to tackle some mind-boggling physics concepts in terms which are fairly easy to grasp.

In this respect, he fares better in the earlier chapters, when dealing with his Class I impossibilities. As the book progresses into more and more speculative territory, he is forced to rely less on extrapolating current research and development, and more on purely theoretical physics.

He indulges himself a little when talking about possible time travel and parallel universes, including perhaps a little too much high-end theory for the average reader, but that is a minor fault in what is otherwise a truly fascinating read.

Some examples of issues tackled in the book - gives reader a better idea of what it would be like to read.

So, what are the chances of force fields, telepathy, sentient robots and teleportation occurring in our lifetimes? Pretty good, but not in the way that Captain Kirk or Han Solo experienced them, that's for sure. Teleportation, for example, is already possible at a quantum level, scientists having successfully transported the information about an atom across a lab instantaneously. It's hugely complex, fraught with problems, and we're still a very, very long way from "Beam me up, Scotty". But the physics does back it up.

Similarly, researchers working on helping paralysed people have had some success in using brain waves to actually manipulate physical objects. Using microchips inserted in the brain, special software and hardware and a process called a biofeedback loop, patients can train their brains to signal for tasks to be performed. Again, this is a million miles from Carrie burning down the school dance in the Stephen King horror film, but it's remarkable nevertheless.

And what about starships? Kaku examines no less than 10 different methods of travelling to the stars, from plasma engines to solar sails, space elevators to nanoships. For many of these ideas, the physics is well known, but there are still colossal problems to overcome in terms of creating suitable technology at a cost which wouldn't cripple the world's economy.

Snappy conclusion.

In one sense, this is an intriguing vision of our possible development over the forthcoming millennia, but at the same time it's also frustrating. After reading Kaku's boundless enthusiasm for the future, what you wouldn't give for a real-life time machine to travel forwards and see just how accurate his predictions are.

Doug Johnston's new novel is 'The Ossians' (Viking £12.99)

This is a very positive review, and consequently has a rather high ratio of description to discussion: the book obviously engaged the reviewer's enthusiasm, so he spends a lot of time telling the reader about things he's learned from the book. A less positive review would probably devote more space to critical discussion, with examples of what went wrong (see the next review for an example).

Note that, even though the style of the review is not particularly formal, it is not personal: the reviewer does not say "I thought that the earlier chapters were the best", he says "[Kaku] fares better in the earlier chapters", and then goes on to explain why he thinks so. You, the reader, do not know the reviewer personally, and don't want subjective opinions: you want considered judgments backed up by evidence.

Lab fab guide to life

Natalie Angier's *The Canon* attempts to explain science to the layman but is defeated by its subject's denseness, says Ian Beetlestone

Ian Beetlestone

[The Observer](#),

Sunday January 13 2008

The Canon - The Beautiful Basics of Science

by Natalie Angier

Faber & Faber £17.99, pp293

Again, we start with an introduction setting the context, and a brief summary of the topic of the book.

The premise of *The Canon*, illustrated by the author's sister cancelling her children's science museum membership as they reach adolescence, is that there is an imbalance to be redressed. Why is it that worldly Manhattan sophisticates feel a working knowledge of the arts is a prerequisite for a fulfilled existence, but that the sciences are irrelevant, something for nerdy adults with no social skills to obsess about?

This book sets out an alternative pantheon. Instead of Shakespeare, Chaucer, Bach, Beethoven, Rembrandt and Picasso, here's the Big Bang, cell structure, evolution and DNA. It's alluring, exciting even, to be shown 'the fairy tales of sciences that happen to be true'. Sciences are 'hard the way diamonds and rubies are hard,' Angier tells us. 'They're built to last and they sure look swell in the light.'

Starting with the idea that 'the best way to teach science to non-scientists is to go for depth over breadth', Angier's research takes her to numerous leaders in their field to find out what they wish people better understood. This is then set out in chapters covering physics, chemistry, evolutionary and molecular biology, geology and astronomy, with a couple of ice-breaking chapters discussing probability, measurement and scientific thinking.

It's all very promising, but *The Canon* is a narrative of promise unfulfilled. Angier's chapters are long, dense and absolutely packed with theory. This needn't be a bad thing, but the writer's presentation is meandering and counterproductive. '[Science is] fun the way rich ideas are fun. Understanding how things work feels good. Look no further - there's your should.' This is Angier's argument for our participation in her re-education project, but the writing gives a different impression.

Jokes are built into almost every paragraph and their structure, usually a series of serious scenarios followed by a comical one, is tiresome. On the phenomena of physics, she asks: 'What distinguishes a fundamental force of nature from the more familiar, frightening forces of nature, like hurricanes, earthquakes, Donald Trump's hairpiece?'

Angier argues that science is for sophisticates and then spends an entire book dressing it up in silly clothes to make it more palatable. Not only is this annoying, it is self-defeating. 'I like science,' she writes, 'I trust it.' Yet her text tells a different story. The folksy humour and the optimistic, upbeat delivery are perhaps just a manifestation of native style in what is a very American book; in fact *The Canon* is at its most successful when this is in the foreground. The chapter on evolution is an impassioned plea for reason that holds an extra anthropological significance for the British reader. 'Only 35 per cent of American adults agreed with the statement that "evolution is a scientific theory well supported by the evidence",' we're told. From over here, that is pretty startling.

There are further successes elsewhere. The chapter on geology begins at the Earth's iron core and progresses, layer by layer, to the furthest reaches of the atmosphere. It's a logical sequence and a narrative the lay reader can

This reviewer makes extensive use of quotes to give a feel for the book's style and the author's viewpoint.

Reviewer's judgment: likes the idea, unconvinced by the execution.

Examples to justify the judgment (again, note that this is not presented as a personal opinion).

Here, the quotes are used to illustrate a criticism of the book's style.

Balancing the criticism by pointing out some of the book's good features.

easily follow. It ends by segueing with great skill into the final chapter on astronomy, with a discussion of that unimaginably profound experience known only to a handful of fortunate space pioneers, 'the transformative moment when they first looked down on the oneness of bright-blue marble Earth, their only home, and Earth looked back and said, "I know."' It is gorgeously put, but there are too few similarly moving moments in a book that promised many.

Conclusion: the author has set herself an impossible task.

But then, enticing though the premise was, it was flawed. Science cannot be accessed in this way. The layman wants a demonstration. Science maintains its outsider status not by means of a conspiracy against its nerdiness, but because, as its advocate readily enthuses, it is big, unwieldy, impossible to pin down. Still, *The Canon* makes a valiant attempt.

This is a more critical review, and written in a somewhat different style: the English is more formal, and there is far more use of direct quotes to illustrate points (this is a legitimate use of direct quotes, and is not plagiarism since the quotes are clearly marked). However, note that the basic structure is very similar: an introduction giving the context and a brief summary of the topic of the book, followed by a more detailed description of the book's content and approach combined with critical judgment about how successful it is, and finally a snappy conclusion summarising the overall verdict. Although the language is more formal, also note the similarity in overall style: again, the critical comments are not presented as personal opinion, but as considered judgments backed up by evidence.