

Q&A

Strange Science

When the makers of the new Marvel movie *Doctor Strange* needed some scientific guidance, they turned to Rochester physicist Adam Frank.

Interview by Peter Iglinski

As you would expect, Adam Frank, a professor of physics and astronomy, has a pretty good handle on the laws of physics in this universe. But what happens when the universe under discussion is fictional? And the beings who populate that universe have super powers?

The makers of the latest Marvel blockbuster, *Doctor Strange*, wanted the fantasy film to have scientific substance. For help, they turned to Frank, who was a science consultant on the film.

mystical master fighting against the forces of evil.

If Strange becomes a sorcerer, why do the filmmakers need a science consultant? Aren't magic and science incompatible?

The interesting thing about the Marvel movies is that they've built a consistent and coherent universe with laws of physics.

They are, of course, not our laws of physics. So when you've got this science-y universe and a character who's all about sorcery and magic, how do you bring that character

neurons are just atoms, so everything can be reduced to the lowest level of structure. But we don't really have a science of consciousness.

I'm a lapsed reductionist. I went into science because I was a reductionist, and as time has gone on, I think there's more that needs to be accounted for. The philosopher David Chalmers wrote a very influential paper in the 1990s called "On the Hard Problem of Consciousness." His perspective was that the vividness of internal experience—the fact that you're present, that there is a present for you in

the world—can't be explained just by atoms. You may need to explain it by some new thing, something else in the universe to explain it.

And I thought that opened up possibilities for the narrative. Now, suddenly, Strange is tapping into this "something else" that is what consciousness is.

Do you regret any of the compromises the movie makes with science—or, at least, our universe's science?

The one place in the movie where I winced a bit was then they used the word "soul." The Ancient One pushes Strange's soul out of his body, and there's a moment of astral projection

I don't really believe in souls. The awesome part for me is I get to tell people about, in Chalmers's words, "the hard problem of consciousness."

My job as a science communicator is to get people to think about how science works. But philosophy is just as important to me in getting people to think about this fundamental question, what is the nature of consciousness? How does consciousness express itself in the material world? What does that tell us about the material world and the world of consciousness? When I do that, I can go home and be happy. 

Adapted and edited from a University podcast at [Rochester.edu/newscenter/doctor-strange-science](https://rochester.edu/newscenter/doctor-strange-science).



SCIENCE? Frank helped address a "particular difficulty with *Doctor Strange*" (played by Benedict Cumberbatch): the source of his powers in Marvel's "science-y universe."

Who is Doctor Strange?

Stephen Strange is a brilliant but arrogant neurosurgeon who loses the use of his hands, at least to conduct surgery, because of a car accident. He looks for some way to heal his hands, and goes through all kinds of surgeries. He ends up in Tibet as a last resort, in front of the Ancient One, a mystical master. She opens him up to the fact that there's more to life, and to the world, than his reductionist way of looking at things. He becomes her disciple and trains to become a sorcerer, an occult

into the universe—Marvel's cinematic science of the universe—in a way that's coherent, but that doesn't damage the character? How do you account for Strange's powers? Where do they come from? I was brought in to help answer those questions.

What solution did you propose?

My take on this was to look at consciousness, rather than to try to explain his powers using neuroscience. In philosophy there is the mind-body problem: what is the relationship between the neurons that are in your brain and the experience of consciousness itself?

There's a reductionist view that says anything, whatever your feelings, love or joy, they're really just neurons, and those