

**BBC ARE BIODEGRADABLE PLASTICS A WASTE OF TIME?**

# Science Focus

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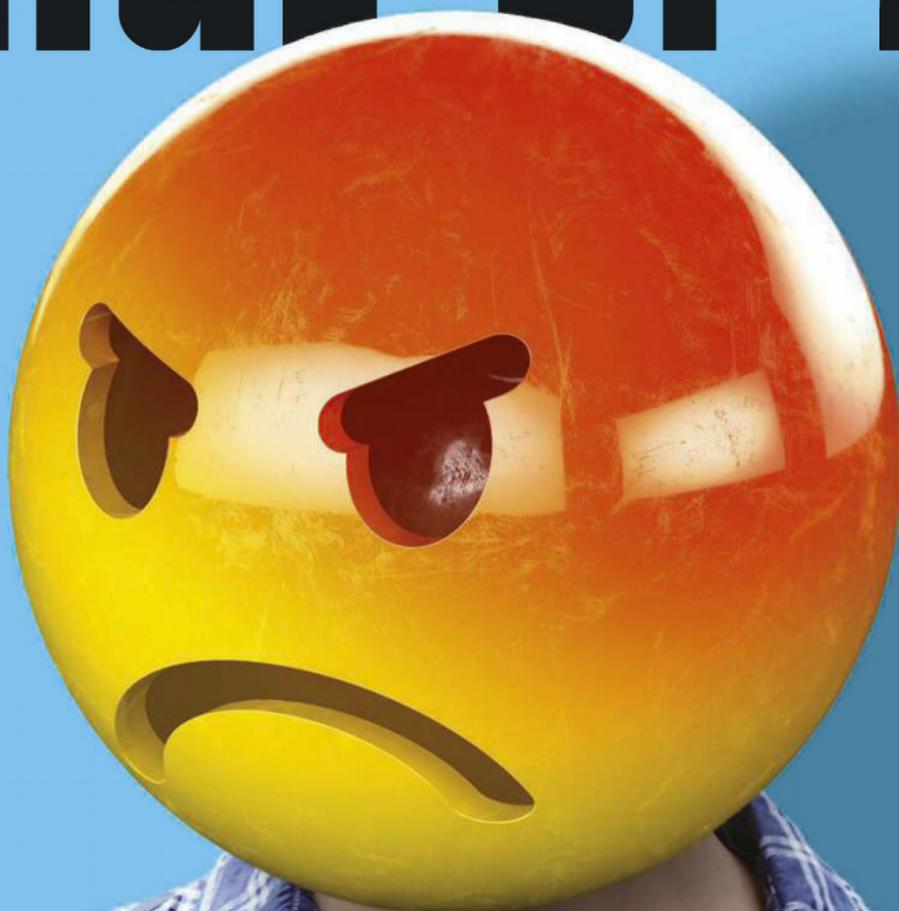
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## Profile

# MAKING IT SO

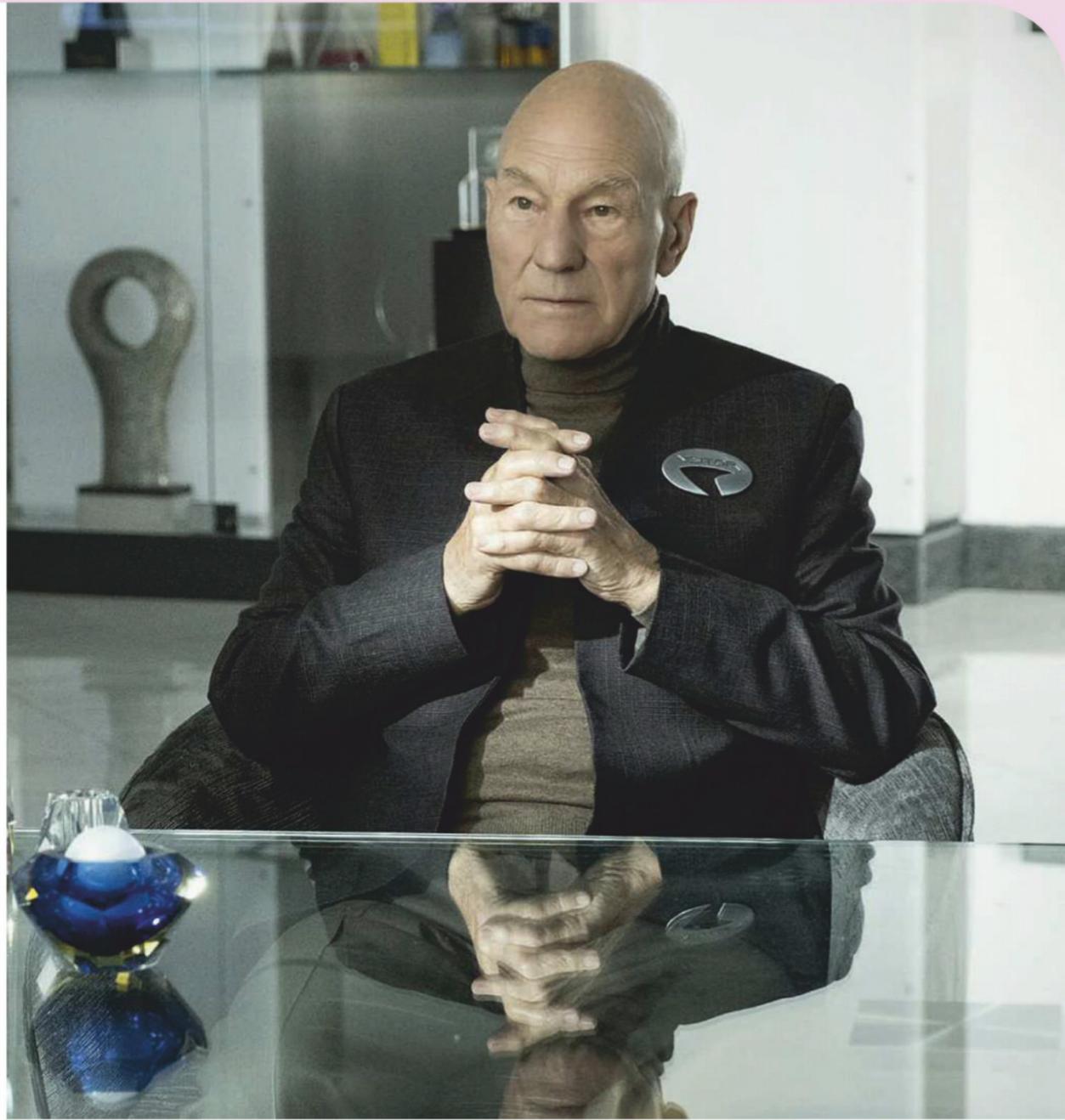
**STAR TREK'S NEWEST SCIENCE CONSULTANT, DR ERIN MACDONALD, REVEALS HER FAVOURITE TECH FROM THE SHOW AND EXPLAINS EXACTLY HOW FASTER THAN LIGHT TRAVEL COULD THEORETICALLY WORK**

### AS SCIENCE CONSULTANT FOR THE STAR TREK FRANCHISE, WHAT DOES YOUR JOB INVOLVE?

Science is a big part of *Star Trek*, and my job involves reading scripts, talking to writers, talking to show runners, discussing the story arc and discussing episode to episode what type of technology they want to use, or what science is driving the story points. But I also continue to provide fan content. I have a video on StarTrek.com where I explain how warp drive works, and I'm due to be a guest on the *Star Trek: The Cruise*, where I'll continue using *Star Trek* to teach science – the fans really enjoy that!

### STAR TREK IN GENERAL SEEMS TO BE GETTING DARKER, DO YOU THINK THIS IS A RESULT OF OUR CHANGING PERCEPTION OF THE FUTURE?

You know, it's interesting. I think a lot of people see *Star Trek* as this bright, shiny thing. If you go back to the original, there are some dark episodes, but it still has a very flashy, sci-fi feel to it. *Deep Space Nine* too, has story arcs that span seasons with very dark themes. So, I don't think that the new episodes are necessarily darker, but I think the stylistic approach to the visuals



**“Nothing with a mass on the surface of spacetime can go faster than the speed of light, but there’s nothing that says spacetime *itself* can’t go faster”**

makes it feel a little darker. As well, we've gone from being episodic storytelling to being serialised, where you're telling one story over the course of 13-16 episodes. Take the Xindi War, or the Dominion War for example. If you took out all the standalone episodes, and turned it into one shorter season, it would feel very dark. We used to have a lot of filler episodes, and I love filler episodes! But that's just not how we tell stories these days in general. Here in America, we've been doing 24-episode seasons for decades. Now, we're starting to take out those fillers and tell one story over a shorter time. *Star Trek* has been reflecting the darker parts of society for a



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## DR ERIN'S TOP SHOWS (THAT AREN'T STAR TREK)

long time, and that goes back to the original series, but more importantly, in *Deep Space Nine* and *Enterprise*. It's interesting to see how storytelling has changed more than the types of stories that are being told.

### IS THERE ANY TECHNOLOGY IN STAR TREK THAT YOU'D REALLY LIKE TO SEE?

Oh, warp drive is my number one! If we can go faster than the speed of light, our whole universe will open up. Faster than light travel is a necessity for most science fiction. Back in the movie *First Contact*, it was Zefram Cochrane testing out the first warp engine that caused the Vulcans to show up and induct humanity into the Federation.

### DO YOU THINK WARP DRIVE IS THEORETICALLY POSSIBLE AND THAT WE'LL ACHIEVE IT BY 2063?

I think theoretically, mathematically, it is possible. The science behind the theory, is basically this idea that our universe is a 'sheet' of spacetime. Nothing with a mass, on the surface of spacetime can go faster than the speed of light – this is Einstein's Theory of General Relativity. At zero mass, you can coast along at a fixed speed, at the speed of light. But, there is nothing that says spacetime *itself* can't go faster than the speed of light. Warp drive is this idea that you can build a bubble of spacetime around your ship, and that bubble propels you faster than light. Our limiter is just our knowledge of spacetime itself. Imagine a bowling ball on a trampoline as an analogy for a mass on this sheet of spacetime – spacetime, our trampoline, will be curved. So, you can warp spacetime with a mass, but also an equivalent amount of energy – a lot of energy. The question we need to answer, is how much energy will get us from point A to point B – but the math at the moment is unclear, so I'm not sure we're on target for 2063, but I'll be the first champion!

### IS BEING A SCIENCE CONSULTANT NOW, HARDER THAN IT WAS IN FOR EXAMPLE, KIRK'S DAY?

Oh, for sure. Sometimes writers will say, 'I don't need a science consultant, I have the internet'. And I don't blame them! Me coming in as a PhD in astrophysics to be a science consultant is kind of a hard sell, because of that exact point. I think a lot of writers have had bad experiences with science consultants, the consultant will just turn around and say 'no, that doesn't work. Sorry, science says no!'

But that's where I take a different approach, I'm not there to be a nay-sayer. I'm there to take an improv approach and say, 'All right, yes! You want to do this crazy time-travel story, let's see how we can make that work!' I'll make sure that they don't put anything 'wrong' in the script. And I love that. It eases the burden for the writers, I have a lot of knowledge already, but if I need to look something up, I know exactly where to look. I'm a sci-fi fan – as well as a scientist – so, for me, it's a dream job.

### ARE THERE ANY CONCEPTS IN SCI-FI THAT ARE JUST NOT POSSIBLE?

As much as a lot of us want transporters, especially when we have to spend hours sitting in airports, it's really one of those physics-says-no situations, because of the Heisenberg Uncertainty Principle. For transporters to work, we would need to break down the body into all its fundamental components, then rebuild it somehow. This means you would need to know *exactly* where all your particles are, but Heisenberg's principle does not allow you to do that – you can't know exactly where subatomic particles are at any one point in time.

But what *Star Trek* did is brilliant, and this is the sort of thing I hope to bring to writer's rooms in the future. They have a component in transporters called the Heisenberg Compensator, and they don't say anything more than that. But for us science geeks, we're like, 'oh, ok, so they compensate for Heisenberg's principle somehow'. I love it when science fiction does that. As long as they're not saying anything wrong when they try to explain it.



#### DR ERIN MACDONALD

Erin is Science Consultant for the *Star Trek* franchise, holding a PhD in Astrophysics. She has an online series "Dr Erin Explains the Universe" and her specialty is general relativity.

Interviewed by BBC Science Focus production assistant Holly Spanner

### DISCOVER MORE



Subscribe to the Science Focus Podcast and listen to our full interview with Dr Erin Macdonald.

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#### FIREFLY (2002 2003)

My love for this show runs so deep, I get emotional just hearing the theme song. The 'Verse is a place that feels so real, the characters are like family to us. It also resulted in my all-time favourite board game, *Shiny*.



#### X-FILES (1993 2018)

This is what started it all for me, it had everything I loved. Seeing a red-headed woman fight aliens with logic and science - she was everything I wanted to be, and resulted in me wanting to study physics.



#### FUTURAMA (1999 2013)

My physics professor actually made me watch this as a contingent for being his research student! You can tell physicists and mathematicians were involved in the writing by the amount of nerdy easter eggs there are!