

From 'trivial issue' to primetime TV—a researcher's journey through plastic

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It is a rare TV programme that has the instant impact of David Attenborough's Blue Planet II.

The scenes of struggling animals choking on bits of [plastic](#), of an

albatross chick, dead from the toothpick its mother had tried to feed it. New extensive bans on single-use plastics were proposed. The Chancellor of the Exchequer railed against the 'scourge of plastic'.

But behind those arresting shots were years of patient research, building up a detailed picture of the global reach of the eight million tonnes of plastic waste thought to enter the oceans each year. Work done by researchers like Tamara Galloway, Professor of Ecotoxicology at the University of Exeter." Even a few years ago, the perception was that plastic pollution was a trivial issue," Tamara recalls. "Too often, our attempts were met with the response: 'don't be silly'."

A threat to human health

Tamara's expertise in biochemistry made her familiar with the impacts of hormone-disrupting synthetic chemicals, including many used in plastics. She was keen to see how plastics, particularly small ones, would help spread the contaminants through the environment.

Tamara was not alone in her plight to tackle the plastic problem. Since 2003, she has collaborated with the University of Plymouth's Richard Thompson, a marine ecologist, who back then obtained funding for a small-scale pilot study that confirmed tiny traces of plastic could be seen in animals and sediments. This led to a more detailed survey of the impacts of marine plastics.

But it was research into [human health](#) that marked a turning point for Tamara. After arriving at the University of Exeter in 2007, she collaborated with researchers in the [medical school](#) to investigate the fate of Bisphenol-A (BPA), a component found in items as diverse as food packaging, water bottles and medical devices. Massive publicity followed the 2008 revelation that the substance, detectable in 90% of adults, is associated with an increased risk of heart disease, diabetes and

asthma. The results underlined the risks to people and the environment that is posed by chemicals associated with plastics.

Tamara says: "The problem is plastics don't degrade. You can think these materials aren't a problem, but this study revealed an issue everybody could see."

Major funding soon followed. Her work was supported by the Department for Environment, Food & Rural Affairs (Defra), the EU and a host of studentships backed by NERC, as well as three major projects worth £1.5 million.

UK stems the flow of plastic microbeads

The techniques that Tamara, Richard and their collaborators needed had to be developed alongside the science. Advanced laser techniques, bioimaging and methods adapted from clinics were all brought to bear on the problem of how microplastics are taken up from seawater and sediments by sea life, and how they make their way up the food chain. Soon they were turning up the evidence that these tiny fragments of plastic have the potential to impact all kinds of marine creatures. Metabolism was being altered; immune function changed. Growth and reproduction affected.

Among Tamara's proudest achievements has been her part in the UK banning of microbeads from cleaning products and some cosmetics, which came into force in June 2018. Two years earlier, with Richard Thompson and other collaborators, she had given parliamentary testimony on the extent of the problem. Their studies were finding plastic pieces in seawater samples from around the world, they explained.

They had identified 280 different species at both ends of the ocean [food](#)

[chain](#) that had ingested microplastics, mistaking them for particles of food.

Although microplastics are made by the breakdown of all kinds of synthetics, including fibres from clothing, their deliberate manufacture to bolster the properties of personal care products struck Tamara as particularly shocking. The House of Commons Environmental Audit Committee agreed, its Chair Mary Creagh MP noting "a single shower can result in 100,000 plastic particles entering the ocean." Defra also agreed. The ban soon followed.

We are all part of the solution

Before then, Tamara was already in New York reporting to the United Nations Environment Programme, which she has described as the pinnacle of her work to get her science out of the lab and into the world. Sharing science, whether with those in power, or through media to persuade a receptive public, is an inevitable extension of her environmental work.

She says: "The problem with plastics has been everybody thought it was somebody else doing the polluting. But we are all part of the solution." Shopping bags, cotton buds and drinking straws are all easily visible items where the public can see their role in the polluting. The bigger problem is that plastics have many benefits. While banning may not be the solution for all of it, cutting off leakages into the environment is.

Tamara's next big goal is to work on bringing together businesses, industry groups, polymer scientists, behavioural scientists and environmentalists to find a way of making the plastic economy more sustainable.

This is just the beginning

Returning to her decisive interest in the direct impacts of BPA on human health, she has been working with school students across Devon, with colleague Professor Lorna Harries from Exeter Medical School, in a citizen science project, hoping to find out how a change in diet can minimise exposure to the chemical.

"It has been a monumental effort," she admits, "involving not just the teenagers but also their families. But everyone was completely engaged. It is a great way to bring your science to the public and helps us to gather way more data. It is hugely valuable."

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