



Biology: uniformity and diversity

Tony the flagellate

Narrator

Gianfranco Novarino specialises in a group of flagellates involved in the clean up of organic pollution.

Gianfranco Novarino, The Natural History Museum, London

A whale is made up of great many cells, a huge number of cells and each cell is specialised in doing something very very specific. Think about the poor amoeba, or the poor flagellate.

They are only made up of cell and with that cell they have to do everything that the whale does so they are rather clever creatures.

Narrator

In order to reach these flagellates, you have to drill down deep. The cores are collected from Cape Cod air force base in America and sent to Gianfranco's laboratory in London.

Gianfranco Novarino

The Cape Cod research started a few years ago and it became immediately apparent that the dominant microbes inside the aquifer apart from the bacteria were flagellates which occurred in only slightly lower numbers than the bacteria themselves. This was a fascinating ecosystem to study because it was very very basic. We had bacteria breaking down organic substance and then we had the flagellates that were grazing on the bacteria.

Narrator

A new technique called 'RNA probing' allows Gianfranco to estimate the number of flagellates in the sample.

Gianfranco Novarino

Conventional stains will stain DNA wherever it is contained so it will stain every microbe in our preparation. On the other hand, by using the RNA probe, it is possible to stain only the organisms that we are really interested in.

Narrator

The flagellates stain yellow. The bacteria don't show up at all. The next step is to prepare new samples. To isolate and identify the organisms they contain.

Gianfranco Novarino

The whole isolation process took a while. It was very exciting even though it was rather a tedious job to isolate. And I think this really exemplifies very much of what research is all about. There was a lot of tedious repetitive work but if there is an underlying enthusiasm, that motivates the researcher, then that's really what research is all about.

This is Tony, a totally undescribed flagellate from an organically contaminated aquifer that I've been studying for a number of years. It's about 5 microns in diameter so pretty small. The reason why it has been named 'Tony', is to honour Tony Minero, the star character of Saturday Night Fever, 1977. Tony Minero used to dance with one arm facing upwards and one facing downwards. And this is exactly how Tony swims. He can swim with one flagellum directed anteriorly, and one directed posteriorly. Although he can also use both flagella to project backwards. It's a beautiful organism.

Obviously this name will be changed to a proper scientific name. So the new name will be introduced in the literature but it's very handy to have these off the cuff nicknames for new organisms that are awaiting formal description.

What you can see here is another cell of Tony. It has slowed down in order to feed on these bacteria, which you see a large number here in the background. And with a bit of luck we might just about be able to see the actual capture of.. Ah. There it goes. Go back a bit. Watch this bacterium here. Now I can play that again. And it's gone. Nice catch for Tony.

Narrator

When there's plenty of food, the boon times Tony shows another behaviour that's typical of microbes.

Gianfranco Novarino

Here you can see another cell of Tony. This cell has four flagella instead of two. The reason for that is that the flagella have replicated prior to cell division. What this cell will do eventually, is divide into two daughter cells, thanks to binary fission. In other words, when the bacterial populations in the acifer are abundant, there will be a population explosion of Tony. However, the story is very different when times are bad. When food is scarce, cells of Tony produce a resistance stage also called 'Cyst'. Which is a means to ensure long-term population survival. The first thing that must be done is to settle down, come to a rest, and retract the flagella, as this cell is doing here. One flagellum has been retracted already and the other one is in the course of being retracted. Eventually this will produce a thick walled resistance stage; we see a few cysts here, which is extremely resistant to heat desiccation, and of course the absence of food.