There's more to nature than the eye can see

Biodiversity research is only as advanced as astronomy was in Galileo's day, says an Irish ecologist, and a new view of nature beckons, writes **Andrew Read**

When we think about nature we are working with the wrong image, according to Dr Sean Nee. We worry only about what we can see, ignoring all the rest. "People think biodiversity is about plants and animals. But most of what's alive on this planet isn't visible to us," says Nee, an animal ecologist. "Our whole view of the natural world is warped by our fixation on what we can see with the naked eye."

Fortunately we're entering a golden era of biodiversity discovery, he says. "At last we're starting to find out what life is really like. It's impossible to predict the picture that will emerge.

"Imagine if astronomers studied only what they could see with the naked eye. Our understanding of the universe and our place in it would be different. Our view of life must be just as distorted," he says.

Modern techniques in molecular biology and a new interest in microscopic life by geologists, oceanographers and even civil engineers – who are interested in sewage ponds – are revolutionising things, he says. "We visibles are finally starting to pay the invisibles some serious attention."

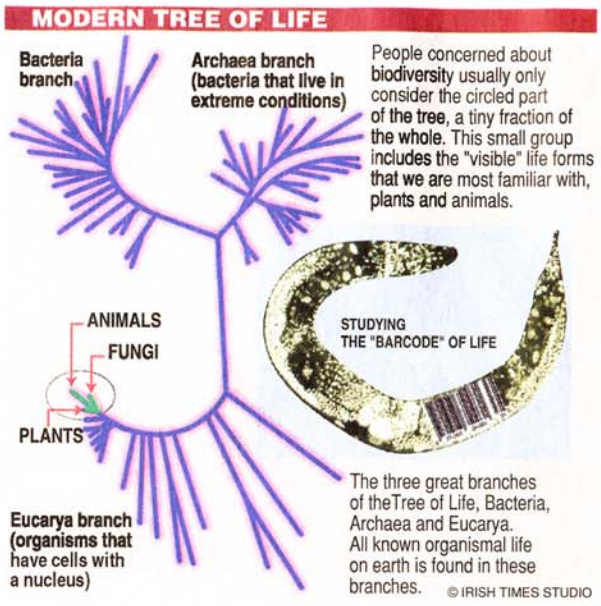
Nee, from Durrow, in Co Laois, is a researcher at the University of Edinburgh. "By whatever criterion you look at life – biomass, number of species or number of individuals – the visibles are just a very small part. I find it shocking that all the visibles are essentially on the same small branch of the tree of life. The rest of the tree is microbial."

At least half of all the biomass on the planet lives under the surface – in the ground or in the oceans, he says. "More than 10 per cent of Earth's biomass is bacteria in ocean sediments. Think about that – we barely know anything about them," he says.

This microbial world is also crucial for our existence. "For the first three billion years of life on our planet, microbes created the conditions in which visible life could evolve over the last 600 million years. And they continue to recycle our nutrients and maintain the composition of our atmosphere. Air is 20 per cent oxygen only because of microbes in the oceans."

Molecular biology provides new ways of looking for invisible life, but perhaps most crucially it provides the tools to describe and organise our understanding of it.

Dr Mark Blaxter, a colleague of Nee at Edinburgh University, agrees. With a graduate student, Robin Floyd, he has been sampling nematodes, round worms usually less than a millimetre long, from a small patch of soil in southern Scotland.



Rather than using the traditional approach of trying to identify the worms by their shapes and body parts they have been looking at their DNA sequences.

"For each worm this allows us to get a molecular signature, which we call a bar code," says Floyd. In a collection of 2,000 worms they've identified 140 molecular operational taxonomic units (MOTUs). MOTUs roughly correspond to species. "About 130 of these are new to science," says Floyd.

Biodiversity: 'It's time to start paying attention to the invisibles'

"Most impressive is that they are still finding new MOTUs at the same rate as they were at the start," says Nee. "This means they haven't even got close to determining the number of species of microscopic worm in just one small patch of dirt."

Nee is hesitant to predict what research on the biodiversity of the invisibles will tell us. "It's like asking an astronomer in the time of Galileo what we'll learn from the telescope."

Nonetheless, he does throw out several observations. "We will find whole new lifestyles," he predicts. "The so-called Dead Sea, for example, is teeming with life – it's just too salty for fish. We've already found invisibles living in rock and in pressurised water heated to 120 degrees Celsius. There will be more of these discoveries."

We may also be taking a grave risk if we do not think about the conservation implications of this new view of nature, he argues. "We get all sentimental about whales and pandas. But with a microbe we keep it if it's useful – brewer's yeast – or try to exterminate it if it harms us – yeast infections."

He is not advocating a campaign to save the smallpox virus, but he does want us to think about microbes.

"From a completely self-centred point of view it does not matter if the panda goes extinct." But we're now learning that we are having an impact on microbial biodiversity.

"Tilled land has less diversity than untilled land, for example. What does this mean?" he asks. "These things maintain our atmosphere, recycle our nutrients, but we're not even watching out for them."