



Life in Abundance

21 January 2024

Lord Rees of Ludlow

Psalm 65: 5–13 *Matthew 6: 26–33*

‘The outward forms of life may vary almost infinitely; but, throughout all this variety – from fungus or moss to rose-bush, palm, or oak; from mollusc, worm, or butterfly to hummingbird, elephant, or man – the biologist recognizes a fundamental unity.’

These words are from Alfred Russell Wallace, co-originator with Darwin of ‘natural selection’ – an explanation of how the bountiful tree of life, maybe 10 million species, has exfoliated from primitive organisms that emerged on the young earth billions of years ago.

Darwin’s great book *Origin of Species* closes with these famous words:

‘There is grandeur in this view of life ... whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful, and most wonderful, have been, and are being evolved.’

Over that immense timespan continents drifted, ice-cover waxed and waned. But all changed when humans emerged, and transformed the planet at an accelerating rate – via agriculture and then industry. The human population has surged to 8 billion – each of us more demanding of energy and resources than our forebears. We’ve entered the Anthropocene era when the footprint of our species can shift the entire planet’s ecology and climate.

It’s imperative to conserve nature, not only because it’s the ‘natural capital’, prerequisite for human flourishing, but also because biodiversity has value in its own right. In his 2015 encyclical *Laudato Si*, Pope Francis urged our obligation to cherish the whole creation – a Franciscan shift from the earlier Catholic stance that ‘man has dominion over nature’. To quote the great ecologist E.O. Wilson, ‘mass extinction is the sin that future generations will least forgive us for’.

We know how much we owe to generations past. We shouldn’t bequeath a depleted and devastated world to the generations that follow us.

Spaceship earth is hurtling through the void – its passengers are anxious and fractious; their life-support system is in jeopardy. And this metaphor leads me to comment on cosmic evolution – tracing history way back before our solar system formed.

We understand the life cycle of stars. They’re powered by nuclear fusion – turning pristine hydrogen into carbon, oxygen, iron, etc. They end their lives by flinging processed debris into space. Our sun and its planets formed from gas already contaminated by debris from earlier generations of stars where it mixes with gas that forms new stars. Most atoms in our bodies were forged in ancient stars that completed their life cycle maybe 5 billion years ago.

We're literally the ashes of long dead stars – or, less romantically, the 'nuclear waste' from the fuel that let them shine. We're linked to the wider cosmos more literally than even astrologers imagine.

The number-one question astronomers are asked is, "Are we alone"? Or is the cosmos teeming with life? This has fascinated thinkers since classical times. In this college, Wilkins in 17th century and Whewell in 19th offered theological arguments that Mars, Jupiter, Venus, etc, were inhabited. They argued that it would be such a waste of the creator's efforts not to populate these other worlds.

Indeed the Scots physicist, Brewster, thought the Moon must be inhabited. He argued, 'Had the moon been destined to be merely a lamp to light our Earth there was no occasion to variegate it with lofty mountains and extinct volcanoes and give its surface the appearance of continents and seas – it would have been a better lamp had it been a smooth piece of lime or of chalk.'

As it's turned out there's zero evidence for even primitive life anywhere else in our solar system. But our cosmic perspective has hugely extended. We've learnt that our sun is one of billions of stars in the Milky Way – which is itself one of billions of galaxies visible with large telescopes. And in the last 25 years research programmes spearheaded by Didier Queloz (Trinity Fellow) have discovered something that renders the night sky far more fascinating. Most stars are orbited by retinues of planets, just as the sun is. Overall our galaxy harbours millions of planets resembling the young Earth.

But did evolution get triggered on these other worlds? We can't lay firm odds at the moment – but there's a realistic chance that next-generation telescopes will offer a firmer answer within 20 years by analysing the faint light from distant exo-planets – seeking evidence for vegetation, or complex molecules in their atmosphere.

This would be a triumph – but I'd like to interject some modesty on behalf of astronomers. It's biologists – confronting life in its abundance – who confront far greater challenges. Even the smallest insect, with its layer upon layer of intricate microstructure, is more complex than a star. I'll personalise this with a local exemplar. Marta Zlatec, a professor in this College, wants to analyse how brains work and starts with the simplest, the brain of an embryo fruit fly – the size of a grain of sand. With her research group, she mapped more than 100,000 linkages in it. Think of the challenge of doing this for a mouse's brain, let alone a human's.

And, to take an enigma closer to my theme, despite amazing biological advances since Darwin, the most crucial step in the origin of life isn't understood. What's still a mystery is the transition from complex chemicals in the primordial slime on the young Earth into entities that can replicate and metabolise, so that Darwinian selection can start its work. This might have involved a fluke so rare that it happened only once in the entire galaxy. On the other hand this crucial transition might have been almost inevitable given the right environment. We just don't know. Nor do we know if the DNA/RNA chemistry of terrestrial life is the only possibility or just one chemical basis among many options that could be realised elsewhere in the cosmos.

And I emphasise I'm talking about simple life. It is of course a separate question whether it's likely to evolve into anything we might recognise as intelligent.

Evolutionists have highlighted several 'bottlenecks' that could choke off the progressive emergence of ever-greater complexity. Our earth could be exceptional in having bypassed such obstacles and hosting such complex life. However, future evolution – perhaps of unimaginable complexity, may be yet to come.

This is why:

The stupendous time-spans of evolution are now part of our common culture; but most people still somehow envisage humans as a culmination – the top of the evolutionary tree. That hardly seems credible to astronomers. Our sun is less than half way through its life, it will be six billion years before its fuel runs out; it then flares up, engulfing the inner planets. And the expanding universe will continue, perhaps forever – to quote Woody Allen, eternity is very long especially towards the end.

So post-human evolution here on earth and far beyond could be more prolonged than the evolution that led to us – and even more wonderful; it could become even faster if genetic enhancement becomes feasible, or electronic cyborgs take over from flesh and blood.

But any creatures witnessing the sun's demise surely won't be human. And post-human evolution won't be Darwinian – it will be via 'secular intelligent design' whereby each generation can choose the characteristics of its progeny.

[I've no time to discuss alien intelligence – which could have formed around a star a billion years older than the sun and had a head-start over us.]

So I'll re-focus closer to the here and now. This 'pale blue dot' in the cosmos that's our habitat is a special place. It may be a unique place. It's existed for 45 million centuries – and its potential future is even longer. But we're its stewards in a specially crucial century – where humans are empowered enough to safeguard and enhance its abundant life's future; but could also leave a devastated world.

Politicians focus on immediate crises, and will only act long-term if they think the public is on-side. Scientists' direct influence on politics is limited: leverage on voters and the media is more powerful if it's amplified by charismatic influencers – I'd highlight, somewhat arbitrarily, four of these.

First, Pope Francis, whose 2015 encyclical was hugely influential at the UN and the Paris climate conference. Second on my list would be our secular pope, David Attenborough. And two more I'd add are Bill Gates and Greta Thunberg.

Over the last few years this disparate quartet have – with many others of course – raised climate and environmental issues on the agenda – and changed at least the rhetoric of business. Unsurprisingly, it's the young – who expect to live to the end of the century – whose clamour for action is loudest, and surely welcome.

We need to think globally, we need to think rationally, and we need to think long-term – we need to be 'good ancestors' empowered by well-directed technology but guided by values that science alone can't provide.

And I take my final words from the great immunologist, Peter Medawar: 'The bells that toll for mankind are like the bells on alpine cattle. They're attached to our own necks – and it must be our fault if they don't make a tuneful and harmonious sound.'