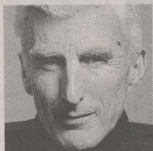


Earth to aliens: we haven't had a signal yet. Could you try again?



MARTIN REES

DOES ALIEN LIFE exist? This is one of the most fascinating questions in the whole of science. I'm hopeful that we'll learn the answer by the end of this century.

In earlier centuries, many believed that the Moon and Mars were inhabited. The science fiction of Jules Verne and H.G. Wells popularised the idea of alien life. We're less optimistic about Mars than our forebears were 100 years ago. There is certainly nothing there like the "Martians" of popular fiction.

An armada of space probes is being launched towards the Red Planet to analyse its surface, to fly over it and (in later missions) to return samples to Earth. Life could also exist in the ice-covered oceans of Jupiter's frozen moon, Europa, and there are plans to land a submersible probe that could explore beneath the ice. Detection of even the most primitive life would be a great discovery — it would offer clues to the mystery of how life began.

Not even the optimists expect to find "advanced" life elsewhere in our solar system. But our Sun is just one star among billions. And in the vastness of space far beyond our own solar system we can rule out nothing. Other

stars have their own retinue of planets circling around them, just as Earth and Mars circle the Sun. Could some of these planets, orbiting other stars, harbour life forms far more interesting and exotic than anything we might find on Mars? Could they even be inhabited by intelligent beings?

Claims that advanced life is widespread must confront the question first posed by Enrico Fermi, the great Italian physicist: if intelligent aliens were common, shouldn't they have visited us already? Why aren't they, or their artefacts, staring us in the face? Shouldn't we have seen so many UFOs that there's absolutely no doubt about them? This argument gains weight when we realise that some stars are billions of years older than our Sun: if life were common, its emergence should have had a head start on planets around these ancient stars.

But the fact that we haven't been visited doesn't imply that aliens don't exist. It would be far harder to traverse the mind-boggling distances of interstellar space than to transmit a signal. That's perhaps how aliens would reveal themselves first.

Searches for extraterrestrial intelligence (SETI) have concentrated on "listening" for radio transmissions that could be artificial in origin, using large radio telescopes — this option is familiar from fictional depictions, such as Carl Sagan's *Contact*. Short stretches of data from the SETI searches have been downloaded by millions of people to use as screensavers on their home PCs — each hoping to be the first to detect ET.

If we found such a signal, could we build up communication? Intelligent aliens would probably be hundreds of

light years away, or more. Can we communicate with beings whose messages may take hundreds, thousands, even millions of years to reach us? There's no scope for snappy repartee.

I wouldn't hold my breath for success. But even if these searches fail, that doesn't mean that we are alone. The brains and senses of the aliens may be so different from ours that we couldn't recognise any patterns in their signals. Or they may not be transmitting at all. The only type of intelligence we could detect would be one that led to a technology that we could

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recognise, and that could be a minor and atypical fraction. Some "brains" may have a quite different perception of reality. Super-intelligent dolphins could be enjoying a contemplative life on some water-covered planet without us even knowing. Still other "brains" could actually be assemblages of "social insects". If evolution on another planet in any way resembled the artificial intelligence scenarios conjectured for the 21st century here on Earth, the most likely and durable form of "advanced life" may be super-intelligent machines whose creators may long ago have been usurped or become extinct. There may be a lot more out there than we could ever detect, or even imagine. Absence of evidence wouldn't be evidence of absence.

Fictional aliens are usually depicted as mammalian bipeds. But the reality,

as the new Science Museum exhibition shows, could be far more exotic. There's an enormous variety of life on Earth, from slime mould to monkeys. Far greater variety could exist elsewhere in the Galaxy; huge bulbous creatures floating in the dense atmospheres of Jupiter-like planets; aliens the size of insects on a planet where gravity pulled strongly; or they may be freely floating in space. The great astronomer Fred Hoyle wrote a classic science-fiction novel called *The Black Cloud*, in which a cosmos cloud permeated by swirling electric currents behaves like a super-intelligent brain.

We know too little about how life began, and how it evolves, to be able to say whether alien intelligence is likely or not. Indeed, if asteroid impacts and volcanic eruptions hadn't happened the way they did, we don't know whether the Earth would have ended up harbouring intelligent reptiles, or just insects; or would there be a convergence towards something humanoid? The emergence of intelligence may require such an improbable chain of events that it is unique to our planet.

Even if aliens don't now exist, they may exist in the far future. It has taken nearly four billion years for human beings to evolve from the first life on Earth. Our Sun has burnt less than half its nuclear fuel supply so it will be another six billion years before it flares up and dies. That allows time for descendants of the human species to evolve, here on Earth and maybe far beyond, into creatures as different from us as we are from protozoa.

Sir Martin Rees is the Astronomer Royal. *The Science of Aliens* exhibition opens today at the Science Museum