What is man (1): Are we alone in the universe?

The first of three edited extracts from Edgar Andrews' new book, *What is Man? Adam, alien or ape?*

Prof Edgar Andrews

It's easy to confuse SETI with YETI because both relate to creatures that probably don't exist. The Yeti is a proverbial beast that inhabits the Himalayas and walks upright like a human, but leaves huge footprints in the snow and strikes fear into the local populace. Related to America's Bigfoot, it is sometimes called the Abominable Snowman (apparently due to a mistranslation of its Nepalese name).

SETI, on the other hand, stands for 'the search for extra-terrestrial intelligence' — the hunt for an intelligent alien who is so unlikely to show up that he might, with some justification, be called 'the abominable no-man'. Yet nations around the world are currently spending eye-watering sums of money looking for him in distant galaxies, and building bigger and better radio telescopes to further their quest. Why, I wonder, would they do that?

The answer is that SETI scientists and the governments and institutions that finance them, believe that the discovery of alien intelligences would help answer our question, 'what is Man?'

Where is Man?

'Found, a planet like Earth but 5 billion years away — best chance yet of extra-terrestrial life'. So ran a headline in *The Times* newspaper on 11 November 2009. Later, a BBC TV news correspondent solemnly declared that the new planet was probably inhabited by 'small flat bugs'.

The 5 billion years was a miscalculation by *The Times* — it should have been half a million light years. But what difference do a few zeros make to a gullible public? Furthermore, you must understand that the bugs in question have not actually been seen. Nor, come to that, has the planet, though its presence can be inferred with a fair measure of certainty.

But small flat bugs? No chance. As Mark Twain once pointed out, 'It's amazing how, for a small investment of fact, one can get such a large return in speculation'. The slightest hint of life elsewhere in the universe, no matter how unlikely, sends the mass media into a frenzy (with NASA, which should know better, not far behind).

Exoplanets

Atheists like the idea that Earth is just one of a countless number of similar inhabited planets in the universe because if true (they argue) it would diminish the significance of life on Earth. This in turn would remove the need to think that Man is anything other than an accident of nature.

So let's pursue our headline and consider the current excitement over what are called 'exoplanets' — planets that exist outside the solar system. First, what are the facts? The search for planets orbiting stars in distant galaxies is a large and growing area of astronomical research. At the time of writing, the on-line *Extrasolar planets Encyclopedia* lists some 1,000 cosmic planetary systems containing over 2,000 planets which are known to be orbiting stars other than the Sun.

The exoplanet (named Gliese 581c) featured in our headline is one of three believed to be orbiting a 'red dwarf" star called Gliese 581 in the constellation *Libra*. Its discoverers claim that it is a rocky planet with a radius 50 per cent greater than Earth and about five times Earth's mass.

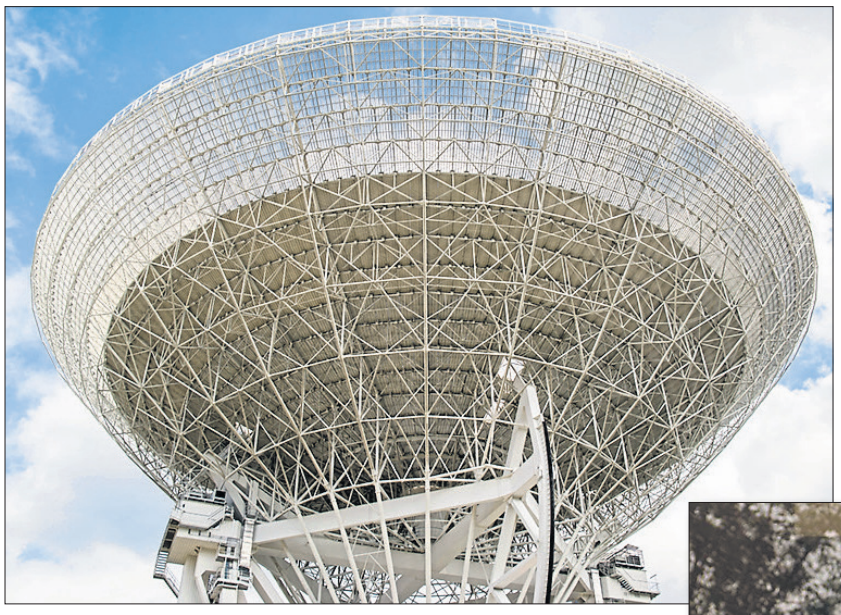
They estimate that its surface temperature places it within the 'habitable zone' of its parent star because liquid water could exist there. And if a planet has liquid water (they argue) then life could have evolved there 'as it did on Earth'.

But why might it be inhabited by small flat bugs? Because with a mass five times that of Earth, the planet's gravity would also be five times greater — enough to flatten even a bug. Why small bugs? Perhaps because an uncritical public are more likely to swallow small bugs than little green men.

I should make it clear that the planet's discoverers said nothing about bugs — that was an invention by the BBC. But their claim that Gliese 581c is a rocky planet like Earth and has liquid water on its surface is itself based on a string of assumptions.

An informed website respondent commented: 'You must remember that neither the mass nor the radius of this planet are actually known. The mass is the *minimum* mass and … could actually be much larger.

'I would not be surprised if it turned out that these planets are all Jupiter-size. The quoted radius of 1.5 Earth radii is the size the planet *would be* if it were terrestrial [rocky] which is not known. We actually have no idea what the density of Gliese 581c is.'



SETI and Mars

But let's leave aside the ill-informed enthusiasm of the mass media and turn to serious science. The search for extra-terrestrial life goes back over a century.

In August 1924 when Mars was at its closest approach to Earth, a 36 hour radio silence was observed in USA (for five minutes every hour) to listen for possible radio signals from Mars. The US Army's chief cryptographer was even assigned to translate any Martian messages that might be detected. I imagine he was quite relieved when his services were not required.

This may all seem rather quaint to us but let's not forget that while we no longer expect to find intelligent life on Mars, the search for more humble life-forms there (extant or extinct) continues unabated. As part of the aptly named 'ExoMars'program, the European and Russian space agencies launched a mission to the Red Planet in March 2016 to analyze the methane gas present in the Martian atmosphere. However, interpretation of the evidence will be crucial.

One commentator says, 'Measurements of methane on Earth suggest that methane originating from geological processes as opposed to biological processes has a distinctive signature in hydrogen and oxygen isotopes ... [but] I've always wondered if we would be able to interpret what this would mean on Mars (for one thing, Mars is greatly depleted in light hydrogen versus deuterium)'.

SETI and the cosmos

But let's return to the wider history of SETI. In March 1955, John D. Kraus published in Scientific American a proposal to scan the cosmos for natural radio signals using a radio telescope. Two years later, and funded by US$71,000 from the National Science Foundation, Ohio State University began constructing a radio observatory called 'Big Ear' — which later undertook the world's first continuous SETI program.

On 15 August 1977, Jerry Ehman, a project volunteer at the observatory, observed a strong signal and wrote 'Wow!' on the recorded trace. Unsurprisingly known as the Wow! signal, some enthusiasts consider it the best candidate to date for a cosmic radio signal from an artificial source. However, additional searches have failed to reproduce the observation and recent investigations suggest that the signal was caused by a passing comet.

Russian scientists also took a strong interest in SETI during the 1960s, using omni-directional antennas to look for powerful radio signals from outer space. Space scientist Losif Shklovsky wrote a seminal book *Universe, Life, Intelligence* (1962) which was followed in 1966 by American astronomer Carl Sagan's best-selling book *Intelligent Life in the Universe*.

In 1971, NASA funded a SETI study that recommended the construction of a radio telescope array with 1,500 dishes at a cost of US$10 billion. Known as 'Project Cyclops', the proposal never saw the light of day, but the report was a major influence in many of today's on-going SETI projects.

So where is everybody?

The failure of SETI to produce any return on investment naturally raises questions. If there are billions of earth-like planets out there in the universe, as many claim, and if intelligent life arises whenever the conditions are just right, where are all these advanced civilizations hiding?

Astronomer Jill Tarter offers two explanations. Firstly, 'the universe is vast and we haven't been able to look everywhere yet. With our current technologies and the time we've dedicated to SETI, we've only searched an incredibly small portion of the universe for intelligent life'.

Secondly, 'we may not have found intelligent life yet because we're stuck with the physics and the technology that we have ... We may not have invented the right way to do this yet.' In brief, then, we're stuck with a big universe and rusty technology. So why do we bother?

I suggest firstly that we persist in seeking this tiny needle in the cosmic haystack because the human race is incurably curious about the universe in which we live. It is this curiosity that drives exploration of all kinds — whether geographic, oceanographic, scientific, psychological, or any other kind.

But I believe there is a more focused reason for the insatiable search for 'life out there', namely, the need to understand ourselves. We *need* an answer to the psalmist's question, 'What is man?' and many believe that the discovery of intelligent extra-terrestrial life would give us one.

Of course, finding bugs on Mars (small, flat or otherwise) is quite a different matter from getting an e-mail from an extraterrestrial. But atheists argue that either discovery would tend to favor the claim that humanity is an uncreated accident of nature that could occur anywhere in the universe given the right conditions.

But if SETI continues to prove unfruitful in spite of all our efforts, we may well have to conclude instead that *as far as we know* humanity is unique on a cosmic scale. And given the supposed abundance of Earth-like planets, a unique humanity would imply something more like a miracle than an accident.

Edgar Andrews is an author, speaker, physicist and engineer. He is Emeritus Professor of Materials at Queen Mary, University of London, and former editor of Evangelical Times