

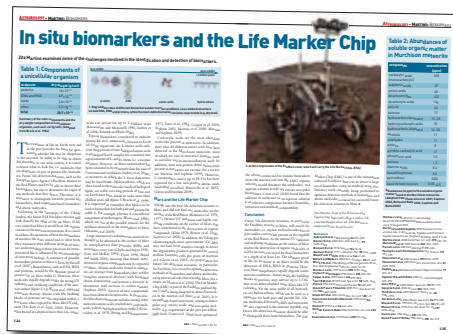
# Astrobiology: young science, old questions

What was it that first got you interested in science? For many, the answer to that question probably goes back to the origin of life (“Where did we come from?”), or the question of life elsewhere (“Are we alone?”). Although people have asked these questions for as long as we have been aware of the world around us, it is only in recent years that there has been any chance for them to move from the realm of science fiction to become the subject of serious scientific scrutiny. Over the past 20 years or so, our knowledge of the universe around us has advanced in leaps and bounds – more than 500 planets have been discovered around other stars, and the nature of objects in our own solar system has been revealed in unprecedented, and often surprising, detail. At the same time, our understanding of life on Earth has advanced incredibly – from sequencing the human genome to understanding the fundamental microbiological processes of ribosome formation in extremophiles (and what happens when it goes wrong). Researchers from across science have come together to attempt to uncover the origins of life, and to search for its signature beyond the Earth. The science of astrobiology has come into its prime.

One of the beauties of astrobiology is that it is, at heart, truly multidisciplinary. It is hard to imagine any other field of study where it is usual for geologists to collaborate with theoretical physicists, biologists to talk to observational astronomers, and chemists to examine data from satellites around other planets. Indeed, far from the scientific model in which people work and talk within fields that continually narrow and specialize, almost excluding all others, astrobiology encourages – and thrives on – its multidisciplinary nature. This is reflected well in the rapid growth of national and international societies, such as the Astrobiology Society of Britain (ASB – see the article by Terence Kee, Mark Burchell and David Waltham on page 1.29) and the Astrobiology Society, which aim to bring together interested scientists from all fields to form a cohesive and exciting community, which is nowhere better illustrated than at the ASB bi-annual conferences (the most recent of which, held last year, was the direct inspiration for this set of papers).

In this issue we present several invited articles that we hope will give the reader a glimpse into

**Jonti Horner introduces a series of papers on astrobiology: the broad but focused discipline examining the possibilities for life off Earth.**



the breadth of astrobiological study. Over the coming decade it is certain that the first Earth-like planets will be discovered around Sun-like stars, while our exploration of both our own planet and the rest of our solar system will continue apace. But where should we look? Unless we are fortunate enough to detect a definitive signal from another civilization, the search for life elsewhere will be long and arduous. Within our own solar system, the rapid growth in the

number of locations deemed potentially habitable means that the local search for life is no longer limited to up-close and personal studies of Mars, and speculative missions to drill through Europa's thick ice crust to the oceans thought to lie below. Lewis Dartnell reviews the ever-widening boundaries within which life as we know it on Earth can survive, on pages 1.25–1.28, while Claire Cousins (pages 1.36–1.38) identifies close analogues on Earth of potential sites for life on Mars. On pages 1.34–1.35 Zita Martins targets the biosignatures that will identify life, while Lucy Norman and Dominic Fortes (pages 1.39–1.42) wonder what life might survive or thrive on Titan.

Beyond our solar system, any detected exo-Earths are so distant and faint that any programme aiming to detect the signature of life will, by necessity, be both financially and temporally expensive, and will likely be limited to just the most promising targets. How we choose those targets is still under some debate, as is the best way in which to carry out the search – both in terms of what we look for, and how we look. Jonti Horner and Barrie Jones (pages 1.16–1.20) try to narrow down the types of exo-Earth that we should examine in detail.

Various technologies will be employed in order to search for evidence of life, both within our own solar system and around distant planets – perhaps including astronautics, as Katya Apagyí and Mark Burchell argue, on pages 1.30–1.33. Some (such as SETI, discussed here by Alan Penny, 1.21–1.24) will focus on the search for intelligent life, while others will concentrate on the smallest and simplest organisms.

At the same time as the search goes on, life will be carried into Earth orbit, to study its behaviour and survivability in drastically different conditions to those on the surface of our planet, while engineers elsewhere take great pains to ensure that other life does not accidentally get exported to the other potentially habitable parts of our solar system.

Despite the difficulties (and, in part, because of them), the next few years will prove to be an enormously exciting and rewarding time to be involved in astrobiology – possibly at once the oldest and the newest of the sciences. Who knows – in 10 years time, we might finally hold the answers to those two oldest questions: “Are we alone?” and “Where did we come from?” ●