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SCIENCE RELIGION AND THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE

DAVID WILKINSON

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David Wilkinson
Durham University

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Dedication

For Alison, Adam and Hannah
With thanks for love and grace

Foreword

Nearly twenty years ago, when I was in my 'Christian period', I wrote to *The Times* suggesting the formation of a 'Canterbury Academy of Sciences' which would grapple with some of the great problems of science and endeavour to advise the clergy, and others, on what Christian attitudes might be. The idea fell on stony ground, but the need remains. One of the problems listed was the possibility of extraterrestrial intelligence (ETI) and what the impact of its discovery on religion might be. Now, in my (temporary?) 'post-Christian period', the need still exists, but an eminent 'scientific theologian', the Rev. Professor David Wilkinson, has seized the nettle and given us his considered views.

David has considered virtually all aspects of the problem: historical views, the likelihood of success in the present search, attitudes to the religious dimension, and so on. Part of this dimension is a case of 'be prepared'; that is, what to say to the flock if a positive detection is announced. Forewarned is forearmed.

The Church is lucky to have someone of David Wilkinson's wide knowledge of both science and theology, and soundly based judgement to act as a guide.

A personal experience of some years ago has relevance, and shows the multifaceted nature of the subject. After a lecture of mine on 'The Search for Intelligent Life', which included a description of our eventual need to leave the Earth when the Sun runs out of fuel, a member of the audience became emotional. He said: 'I am incredibly heartened to know that when our successor Christians leave the Earth they will act as missionaries to spread The Word beyond the confines of our planet.' The reason for mentioning this is that it is one of many unexpected aspects of ETI, and one that is relevant to any religion, not just Christianity.

In this book the author gives us a fine explanation of where we have reached in the ETI search, as well as his views on the religious aspects of 'life in space'. This is both a scholarly work, with copious references, and a very readable one. For atheists and believers alike, there is much food for thought.

Professor Sir Arnold Wolfendale, FRS, 14th Astronomer Royal

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The staff at OUP have been a delight to work with and I am grateful to my colleagues and students at St John's College for the gift of study leave during which this book was written.

In all that I do I am constantly and generously supported by Alison, Adam and Hannah to whom this book is dedicated.

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David Wilkinson
St John's College
Durham University
March 2013

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Contents

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Introduction

After its seven minutes of terror in negotiating the atmosphere, NASA landed its robotic rover Curiosity on the surface of Mars in August 2012. Its primary goal was to investigate whether conditions have ever been favourable for microbial life and for preserving clues in the rocks about possible past life. It was a small part in addressing the big question of whether we are alone in the Universe.

Curiosity carries equipment to gather and analyse samples of rocks and soil, but it also carries on it the signature of Clara Ma, a high-school student from Kansas. Clara was the 12-year-old winning entrant in a national naming contest for the rover. She wrote: 'Curiosity is the passion that drives us through our everyday lives. We have become explorers and scientists with our need to ask questions and to wonder' (Ma, 2009).

While Dorothy Parker characteristically said that 'Love, curiosity, freckles, and doubt' were the four things she had been better without, curiosity is at the heart of the scientific enterprise and indeed part of what it means to be human.

The search for extraterrestrial intelligence (SETI) is now entering its most important era of scientific development. New observing techniques are leading to the daily discovery of extrasolar planets, and the Kepler mission has already collected more than 1,000 planetary candidates. From the discovery in 1995 of the first planet around a star similar to our Sun, this deluge of data is transforming the scientific and popular view of the existence of extraterrestrial intelligence. Earth-like planets outside our solar system can now be identified and in future years explored for signs of life.

The Astronomer Royal, Lord Martin Rees, calls this our 'greatest quest' (Rees, 2003b: 25), and others have said that the discovery of any form of extraterrestrial intelligence (ETI) would be 'one of the greatest events in the history of humankind' (Almar and Race, 2011). This is certainly borne

out by the public interest in such a subject. From the inevitable question at the end of any public talk on astronomy, through the popularity of science fiction, to the more than 3 million people who have used their home computer to download and analyse some of the SETI Institute's data-stream from radio telescopes, very few areas of science spark the imagination and feed fascination as does this one.

Perhaps at its very core is the question of what it means to be human. If the human species is just one intelligence among many in the Universe, then some think that our cosmic status is somewhat different to our being the unique seed of consciousness. A constant question is asked of big science, whether it be the Large Hadron Collider or space telescopes, which is: what does this mean for us? In this context a positive result for SETI seems to be at least as important as the nature of the Higgs particle or the history of the Big Bang.

Yet in the light of this it is odd that SETI as a scientific discipline has found it difficult to secure public funding. Many of the SETI searches continue to be supported by private benefactors. This is no doubt a reflection of how difficult the task is, and the lack of confidence in early or definitive results. Yet there may be other significant factors, such as the complexity of interpretation of what a positive result might be and what it might mean. There are a number of voices who seem to describe a scenario where the message from humanoid aliens reaches us already translated into English, leading to the rapid advancement of our society and the closing down of religion. But the whole question is much more complicated and indeed much more exciting for science and religion.

It is now more than 50 years since the publication of the first scientific papers which began the modern era of SETI. While there is a long intellectual tradition predating this in considering the implications of other possible worlds, religious thinkers, with a few and notable exceptions, have been relatively silent in the last few decades on this subject. It is certainly the case that mainstream Christian theology has not engaged at depth, leaving much religious speculation to the writers of popular science (Davies, 2011a). Current scientific advances in SETI are now showing the danger of such an absence of theological engagement. Faith communities still working through relationships between Big Bang and the creation narratives, natural selection and God's purpose, neuroscience, and what it means to be human, could be hit by a tidal wave of questions following indications of success in SETI.

This book arises out of a conviction that the issues that SETI raises, whether it is successful in the short-term, long-term, or not at all, are

fruitful rather than destructive for religious belief. This is therefore not the construction of defences against a tidal wave of questions, but an attempt to understand the lie of the land identifying both challenges and opportunities. In order to do this we need to set out the scientific arguments undergirding SETI, with particular attention to the history, the uncertainties in arguments, and the strength of the data already assembled. It is important to do this carefully rather than to rush too quickly to the religious implications. Faith communities do themselves great disservice by not taking time to understand the science involved. Even before that we need to recognize that science does not stand apart from a culture in which it exists. Media images, religious sensitivities, and contemporary narratives all have a subtle part to play in shaping science, challenging it, and using its discoveries. Perhaps nowhere has this been more of the case than in the dialogue between science and science fiction in speculation about SETI. We will therefore need to review the current cultural and past historical situations as they impact on SETI. Only having done all of this, we will then move on to consider the way that scientists working in the area have used SETI in either supporting or attacking religion. It is fascinating to see that the arena of SETI has been filled with many of the conversations of science and religion which we have seen in other contexts. We will encounter again the classic arguments for the existence of God, the nature of the Christian Scriptures, and the basis for religious belief. The final section gives an initial theological response, and argues that part of the motivation for SETI has religious resonances.

Many historians of science point to the influence of the Christian faith in the development of the kind of curiosity upon which science is based. The Greeks had developed science employing human logic to understand the world. However, astronomers such as Galileo and Kepler realized that if the Universe had been created freely by God, not bound by human logic, then it was necessary to first and foremost look at the Universe in order to find out what it was all about. This theological emphasis on observation became the basis for the empirical science we practice today, believing that it is worth even $2.5 billion to put a rover on the surface of Mars.

The broadcaster Alistair Cooke once said: ‘Curiosity endows the people who have it with a generosity in argument and a serenity in their own mode of life which springs from their cheerful willingness to let life take the form it will.’ This form of curiosity seems to me to be important for science, faith, and life itself. This book will argue that theologians need to take seriously SETI and to examine some central doctrines of religious

belief in the light of the possibility of extraterrestrial life, hopefully with a spirit of such curiosity.

Any Christian theologian pursuing this kind of enquiry is reminded of the often quoted case of Giordano Bruno, who in 1600 was burnt at the stake at the hands of the Inquisition for exploring issues such as SETI. In fact, he was found guilty of multiple charges of which an infinite Universe and a plurality of other worlds were simply a small part (Rowland, 2008). Nevertheless, if that is not enough to indicate that one should proceed with caution, then one can also be reminded of the words of Thomas Paine in *The Age of Reason*. Commenting on Christianity and the existence of other worlds, he claimed that he who thinks he believes in both has 'thought but little of either'!

Of course, at the very beginning one must acknowledge the difficulty of the task and my own limitations in addressing the question. If the science is complex and in places controversial, religion itself is a diverse phenomenon existing in different cultural forms with a wide diversity in theological understanding. I therefore need to limit this question to the tradition I know best, which is Christianity. This is not to devalue other religious traditions or to say that Christianity is the easiest to fit with SETI; it is simply a practical matter of what is possible, and perhaps a small encouragement to thinkers from other faith communities to do similar pieces of work.

I write this here in Durham University. Only a few miles away, in the eighteenth century, the astronomer Thomas Wright stated in his *The Use of Globes*, 'stars are so many suns, that each of these stars or suns is attended, (as ours is) by a proper number of planets and comets; and that each hath a gravitating power independent of each other . . . (so that) these several systems cannot interfere with each other' (Wright, 1740). Then, in his *An Original Theory or New Hypothesis of the Universe* (1750), he used a plurality of worlds to give hope:

> *In this great Celestial Creation, the Catastrophy of a World, such as ours, or even the total Dissolution of a System of Worlds, may possibly be no more to the great Author of Nature, than the most common Accident in Life with us, and in all Probability such final and general DoomsDays may be as frequent there, as even Birth-Days or Mortality with us upon this Earth. (Wright, 1750)*

Among the manuscripts in Durham University Library there is a sequel to this later volume, in which he expresses the belief that the sky is solid and studded with inward-pointing volcanoes down whose shafts we see the stars. Eccentric and bizarre—but as Hoskin and Rochester conclude, Wright

was attempting to articulate a cosmology in which the divine, moral, and scientific universes were integrated (Hoskin and Rochester, 1992).

This book may be seen by some of my colleagues in science and theology as equally eccentric and bizarre. But I am convinced that even if integrating the divine and scientific universes is a step too far, the two need to be brought into dialogue.

1
Cinema, Cults, and Meteorites: Searching for Something More

Scientific curiosity does not exist in a vacuum. Science is done by men and women who want to ask questions about the Universe, but also need to look for and justify funding both within and outside the scientific community. Priorities in science vary over time, building on what has already been discovered, what technology now makes possible, and indeed political agendas. In the 50th anniversary year of the publication of Thomas Kuhn's *The Structure of Scientific Revolutions,* it is worth being reminded of the way that science navigates its way through the turbulent waters of power structures and beliefs (Kuhn, 1962).

As Alan Boss's brilliant history of the recent programmes of searches for extrasolar planets makes clear, science is both exhilarating and frustrating as it attempts to navigate these choppy waters of internal scientific disagreements and external changing circumstances (Boss, 2009). SETI in particular has been susceptible to such conditions; yet it has additional currents to deal with, not always shared by other scientific questions. These are the worlds of science fiction, intense media interest, and religion.

1.1 Science and Fiction? Universes Full of Aliens

A number of years ago the cosmologist Lawrence Krauss wrote an entertaining book on the physics of *Star Trek* (Krauss, 1997). He justified this diversion from his usual scientific output with the observation that the number of people who did not recognize 'Beam me up Scotty' was comparable to the number of people who had never heard of ketchup. More importantly, he suggested that '*Star Trek* is a natural vehicle for many people's curiosity about the Universe.' (Krauss, 1997: xvi) In his foreword to the book, Stephen Hawking echoed this, saying, 'Science fiction like *Star Trek* is not only good fun but it also serves a serious purpose, that of expanding the human imagination.' (Krauss, 1997: xi)

To judge by the consumption of science fiction in television, novels, films, and video games, the public feed very readily on expanding the human imagination. Science and science fiction exist symbiotically in this. One of the central aspects of the relationship has been the existence and nature of extraterrestrials. Science fiction films depicting extraterrestrial life go back more than a century. In 1902 the French film director George Milies created the classic silent movie short *A Trip to the Moon*, which featured Moon men encountered by astronauts from Earth. Aliens have become more and more part of the culture of our present-day world. Whether friendly or hostile, it seems that aliens are everywhere in the universe of science fiction. ET is stranded by his mother ship and is cared for by a group of children, while the aliens of *Prometheus* are cosmic engineers of life. You can be a cowboy, a group of children on a London estate, or science fiction nerds on a trip across America, and you will encounter aliens.

Indeed supreme in portraying a galaxy bursting with alien life is *Star Trek*. First broadcast on 8 September 1966, Gene Roddenberry's vision 'to boldly go' to seek out new life and new civilizations has, through a number of spin-off series and movies, led to an encounter with more than 350 different species. One of the most interesting features of the first series was the role of Leonard Nimoy as the Vulcan science officer, Mr Spock. The television network executives were very doubtful about having an alien on board, but he became the focus of public enthusiasm for the series. Indeed, alongside the elements of galactic soap opera and imaginative technology, aliens became a central part of the appeal.

The theologian Thomas O'Meara is quite dismissive of such things. He writes of science fiction: 'Theology need not spend much time on these images, for they are entertainment', and then goes on to say that not much science fiction alludes to religion (O'Meara, 2012: 34). However, there has been a major movement in theological thinking in the last two decades, recognizing not only the religious connections of popular culture but also the way that science fiction exposes through its stories fundamental issues of science and theology (Consolmagno, 1996; May, 1998; Alsford, 2000; Wilkinson, 2000; Detweiler and Taylor, 2003; Oswalt, 2003; Lynch, 2005; Lynch, 2007; Cowan, 2010). Some years ago, Cooper and Skrade pointed out the way that film can charm, enlighten, and disturb us (Cooper and Skrade, 1970). It can expand the imagination in both science and theology.

The world of science fiction has continually expanded and shaped the public imagination in ways that at times have been beneficial for SETI and

at times have been misleading. Concepts such as warp drive give a sense that interesting new civilizations can be reached within the time-scale of a TV programme or a movie. A Milky Way generously populated by alien life, from aggressive Klingons to cuddly Tribbles, forms the picture that the Universe is teeming with life, all wanting to be in contact.

In fact, such pictures may provide false hope for SETI. The distances between the stars are vast and provide a major obstacle to contacting ETI or even knowing that there might be something interesting around another star. When astrophysicist Carl Sagan came to write his novel *Contact* he wanted to explore how an extraterrestrial message could be received and what its effects would be, including how it might be received by the world religions (Sagan, 1988). To move the narrative forward, however, he wanted some kind of meeting between humans and alien beings, but the vast distances would be a major problem. This led to some speculative science. Sagan asked colleagues Thorne, Morris, and Yurtsever to consider whether it was possible to overcome this problem by space travellers crossing the vast distances of the Universe by means of 'wormholes'. Since the 1930s it had been known that the equations of General Relativity allowed the possibility of very small 'tunnels' linking one black hole with another black hole somewhere else in the Universe. Thorne, Morris, and Yurtsever found that under special circumstances such wormholes could allow the possibility of travel (Morris *et al*., 1988). You could enter a black hole in one part of the Universe and emerge elsewhere. It is fair to say that such a possibility is not universally accepted, and there are two major problems. First, the intense gravitational forces around a black hole may 'spaghettify' space travellers before they even reach the event horizon, and second, the theory may be fully confirmed only if someone were prepared to test it. The problem, of course, is that if the theory is wrong, it is a one-way trip into a black hole. It is therefore unlikely that there would be a lot of volunteers!

Another aspect of science fiction, especially in movies and on television, is that the aliens on the whole are pretty much like us. Rick Berman, executive producer of the various *Star Trek* spin-off series, comments: 'We can come up with hundreds of different aliens, but the attractive thing about *Star Trek* is familiarity' (Sekuler and Blake, 1998).

These may be the questions of science fiction, but we will meet them later as we assess the scientific arguments. How might we communicate or know of the existence of ETI across vast distances? How widespread might intelligent life be within our own Galaxy? And how like or unlike us might intelligent life be elsewhere in the Universe? These might be the fun of science fiction, but they are central questions to the science.

1.2 Science and the Media: Understanding the Universe from a Piece of Rock

If science fiction has given a particular context as the public looks at the issue of SETI, the news media also provide opportunities and challenges.

In August 1996, news outlets around the world went wild about Allan Hills 84001. Weighing 1.9 kg, and found in the location of Allan Hills in Antarctica in 1984, meteorite ALH 84001 contained pockets of glass which carry the same gases that constitute the atmosphere of the planet Mars. They are sufficiently different from the atmosphere of the Earth to suggest that the rock itself was once part of the martian surface. It was crystallized from magma on Mars and then ejected from the planet due to an asteroid impact some 16 million years ago. It is one of eleven such meteorites that are believed to have come from Mars as a result of this kind of process. Mars material is, in fact, quite abundant. Some 500 tons falls on the Earth each year. In 1911 a piece of Mars known as the Nakhla meteorite fell to Earth in Egypt, and killed a dog.

ALH 84001 wandered the inner Solar System until 13,000 years ago, when it entered the Earth's atmosphere and landed in Antarctica. It was discovered in 1984, and in 1996 a team of NASA scientists led by Dr David McKay published a claim to have found evidence inside the meteorite of long-dead microbes. They identified fine-grained magnetite and iron sulphide particles which are similar to those produced by bacteria on Earth. In addition, tiny spheres of carbonate materials were argued to be further evidence of biological byproducts. Television and newspapers presented pictures showing worm-like structures no more than a hundredth of the diameter of a human hair, with the claim that this was a fossil of a martian bacterium. The British *Daily Mail* called it 'virtually nothing but a vague orange-coloured smudge'!

Yet this 'smudge' led to worldwide headlines of 'we are not alone'. President Clinton hailed the discovery in the following way:

> *Today, rock 84001 speaks to us across all those billions of years and millions of miles. It speaks of the possibility of life. If this discovery is confirmed, it will surely be one of the most stunning insights into our Universe that science has ever uncovered. Its implications are as far-reaching and awe-inspiring as can be imagined. Even as it promises answers to some of our oldest questions, it poses still others even more fundamental. We will continue to listen closely to what it has to say as we continue the search for answers and for knowledge that is as old as humanity itself but essential to our people's future. (Clinton, 1996)*

It is worth noting that he did not enter into the details of what those old and fundamental questions might be! Yet the language is dramatic, and shows the kind of reception that will be part of any claim that SETI has been successful.

The then NASA Administrator Dan Goldin said that public excitement about this field of SETI 'is beyond belief'. One can understand the interest in this. Paul Davies commented:

> *Even the discovery of a single extra-terrestrial microbe, if it could be shown to have evolved independently of life on Earth, would drastically alter our world view and change our society as profoundly as the Copernican and Darwinian revolutions. It could truly be described as the greatest scientific discovery of all time… it is hard to see how the world's great religions could continue in anything like their present form should an alien message be received. (Davies, 1995: xi)*

Here science and religion are coming together in a news story about a piece of rock. Yet this incident is a cautionary tale. It was difficult to see in the headlines the difference between the discovery of little green men and women being found on Mars and the possible discovery of fossilized leftovers that could have been produced by primitive life. This tendency to make an inevitable link from primitive to intelligent life is often seen in SETI.

Furthermore, assessing the evidence is often very difficult for the media to represent. As the team responsible for the claim has admitted, the evidence so far is not compelling proof. In the original paper in *Science*, they make clear that every feature of ALH 84001 can be explained by itself simply without the idea of life on Mars (McKay *et al*., 1996). Indeed, a great number of the scientific community have discounted the claim of fossil life, arguing that the structures, taken by the NASA team as evidence of life, can be explained by non-biological chemical or mineralogical processes (Rothery and Zarnecki, 2011: 116–120). This would point to another formation mechanism rather than microbes. Yet these arguments have not made the front pages of the *Daily Mail.*

In addition, even if there is evidence for fossil bacteria, can we be fully sure that they evolved on the surface of Mars? It is not impossible that bacteria could have entered the rock during its time on Earth, though the fact that they are deep inside makes this unlikely. Another possibility, also unlikely but not to be ruled out, is that the rock was on its second leg of a round-trip ticket to Mars. The rock could have initially been ejected from the Earth by the same mechanism which ejected it from the surface of Mars. Micro-organisms can survive quite lengthy journeys in space,

provided they are concealed deep in rocks. We may be simply seeing a primitive organism which evolved on the surface of the Earth and which has gone on its own space journey. One of the big questions for the discovery of life on Mars is whether it has arisen independently, or whether the Earth and Mars form their own 'biosphere'.

It is interesting to note that the concept of life being carried through space by meteorites is not new, being proposed by Lord Kelvin in the nineteenth century. Nor are claims of life on Mars a new idea. In 1877 the Italian astronomer Giovanni Schiaparelli reported the existence of dark lines on the surface of Mars. He described these lines as 'canali', which means 'channels' but was misunderstood in English as 'canals'. As a result, a century ago Percival Lowell built his own observatory in Arizona to look for life on Mars. He observed the surface of Mars and saw patterns which changed. He identified such changes with life. The belief grew that the canals were built to bring water from the polar ice caps to the vegetation of the equatorial regions—a belief that was later shown to be mistaken.

Nevertheless, fuelled by interest in the question of life on other planets, NASA's Curiosity rover is exploring the surface of Mars. From its landing site—interestingly named after science fiction author Ray Bradbury—it will analyse dozens of samples drilled from rocks or scooped from the ground, investigating whether the area has ever had or still has environmental conditions favourable to microbial life—both its habitability and its preservation. It carries a payload more than ten times as massive as those of earlier Mars rovers. The crater was selected on the basis that it had exposures of minerals formed under wet conditions. While there are no artificial canals on Mars, early in its history the planet did have water on the surface. The three conditions believed to be crucial for the possibility of life are liquid water, certain chemical ingredients, and a source of energy. Every environment on Earth where there is liquid water sustains microbial life. Thus, since the mid-1990s NASA has adopted the strategy of 'following the water' in the search for extraterrestrial life.

This mission, costing $2.5 billion, is only a small part of the exploration of Mars. So far, since the 1960s, more than forty missions have been sent to Mars. In the more recent period, the Pathfinder mission (1996–98) landed its Sojourner rover, returning results which suggested that early in its history Mars may have had liquid water on its surface and a thicker atmosphere. The photographs of the martian surface were stunning, and the technical feasibility of reasonably low-cost missions to Mars was proved.

In 2001, Mars Odyssey began its orbital mission which would lead to strong evidence for large quantities of frozen water mixed into the top layer