Passage 2 IS THERE ANYBODY OUT THERE?

The Search for Extra-terrestrial Intelligence

The question of whether we are alone in the Universe ( ) has haunted ( ) humanity ( ) for centuries, but we may now stand poised ( ) on the brink ( ) of the answer to that question, as we search for radio signals from other intelligent civilisations ( ).This search, often known by the acronym ( ) SETI (search for extra-terrestrial ( ) intelligence), is a difficult one. Although groups around the world have been searching intermittently ( ) for three decades ( ), it is only now that we have reached the level of technology where we can make a determined attempt to search all nearby stars for any sign of life.

A

The primary reason for the search is basic curiosity-the same curiosity ( ) about the natural world ( ) that drives ( ) all pure science. We want to know whether we are alone in the Universe. We want to know whether life evolves naturally if given the right conditions, or whether there is something very special about the Earth to have fostered ( ) the variety of life forms that we see around us on the planet. The simple detection of a radio signal will be sufficient ( ) to answer this most basic of all questions. In this sense ( ), SETI is another cog in the machinery ( ) of pure science which is continually pushing out the horizon ( ) of our knowledge. However, there are other reasons for being interested in whether life exists elsewhere. For example, we have had civilisation on Earth for perhaps only a few thousand years, and the threats of nuclear ( ) war and pollution over the last few decades have told us that our survival may be tenuous ( ). Will we last ( ) another two thousand years or will we wipe ourselves out ( )? Since the lifetime of a planet like ours is several billion years, we can expect that, if other civilisations do survive in our galaxy ( ), their ages will range from zero to several billion ( ) years. Thus any other civilisation that we hear from is likely to be far older, on average, than ourselves. The mere existence of such a civilisation will tell us that long-term survival is possible, and gives us some cause for optimism ( ). It is even possible that the older civilisation may pass on ( ) the benefits of their experience in dealing with threats ( ) to survival such as nuclear war and global pollution, and other threats that we haven't yet discovered

B

In discussing whether we are alone, most SETI scientists adopt ( ) two ground rules ( ). First, UFOS (Unidentified Flying Objects) are generally ignored ( ) since most scientists don't consider the evidence ( ) for them to be strong enough to bear ( ) serious consideration (although it is also important

to keep an open mind （ ） in case （ ） any really convincing （ ） evidence emerges （ ） in the future). Second, we make a very conservative （ ） assumption （ ） that we are looking for a life form that is pretty well like us, since if it differs radically （ ） from us we may well not recognise （ ） it as a life form, quite apart from （ ） whether we are able to communicate with it. In other words, the life form we are looking for may well have two green heads and seven fingers, but it will nevertheless （ ） resemble us in that it should communicate with its fellows （ ）, be interested in the Universe, live on a planet orbiting （ ） a star like our Sun, and perhaps most restrictively, have a chemistry, like us, based on carbon （ ） and water.

C

Even when we make these assumptions, our understanding of other life forms is still severely （ ） limited. We do not even know, for example, how many stars have planets, and we certainly do not know how likely it is that life will arise （ ） naturally, given the right conditions. However, when we look at the 100 billion stars in our galaxy (the Milky Way) （ ）, and 100 billion galaxies in the observable （ ） Universe, it seems inconceivable （ ） that at least one of these planets does not have a life form on it; in fact, the best educated guess we can make, using the little that we do know about the conditions for carbon-based life, leads us to estimate （ ） that perhaps one in 100 000 stars might have a life-bearing （ ） planet orbiting it. That means that our nearest neighbours are perhaps 100 light years away, which is almost next door in astronomical terms （ ）.

D

An alien （ ） civilisation could choose many different ways of sending information across the galaxy, but many of these either require too much energy, or else are severely attenuated （ ） while traversing （ ） the vast distances across the galaxy, It turns out that, for a given amount of transmitted （ ） power radio waves in the frequency （ ） range 1000 to 3000 MHZ travel the greatest distance, and so all searches to date have concentrated on looking for radio waves in this frequency range. So far there have been a number of searches by various groups around the world, including Australian searches using the radio telescope （ ） at Parkes, New South Wales. Until now there have not been any detections from the few hundred stars which have been searched. The scale of the searches has been increased dramatically （ ） since 1992, when the US Congress （ ） voted （ ） NASA 1O million per year for ten years to conduct （ ） a thorough （ ） search for extra-terrestrial life. Much of the money in this project is being spent on developing the special hardware （ ） needed to search many frequencies at once （ ）. The project has two parts. One part is a targeted search （ ） using the world's largest radio telescopes, the American-operated telescope in Arecibo, Puerto Rico and the French telescope in Nancy in France. This part of the project is searching the nearest 1000 likely stars with high sensitivity （ ） for signals in the frequency range 1000 to 3000 MHZ. The other part of

the project is an undirected（ ） search which is monitoring（ ） all of space with a lower sensitivity, using the smaller antennas （ ） of NASA'S Deep Space Network.

E

There is considerable debate（ ） over how we should react if we detect a signal from an alien civilisation. Everybody agrees that we should not reply immediately. Quite apart from the impracticality （ ） of sending a reply over such large distances at short notice （ ）, it raises （ ） a host of （ ） ethical （ ） questions that would have to be addressed （ ） by the global community before any reply could be sent. Would the human race face the culture shock （ ） if faced with a superior （ ） and much older civilisation? Luckily there is no urgency （ ） about this. The stars being searched are hundreds of light years away, so it takes hundreds of years for their signal to reach us, and a further few hundred years for our reply to reach them. It's not important, then, if there's a delay of a few years, or decades, while the human race debates the question of whether to reply, and perhaps carefully drafts （ ） a reply.