TWO ADDITIONAL COMMENTS

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ABSTRACT. Wandering in the wilderness (1) of search space and (2) among the stars.

Thank you very much, Harlan, for allowing me a few minutes for some additional remarks. I want to comment quickly on two rather disparate topics: (1) optimized search strategies and (2) interstellar exploration.

1. OPTIMIZED SEARCH STRATEGIES

An optimized search strategy must rely on some knowledge of the putative signal. Several beautiful engineering solutions to signal-detection problems of this kind were presented at this symposium. As an engineer and computer programmer, I can appreciate these ingenious and elegant conceptions and designs. As a scientist, however, I wonder whether these devices may be rejecting signals because they do not fit our assumptions about ETI.

I don't need to remind this audience that the two Nobel prizes in radio astronomy, for pulsars and for the microwave background, were awarded for serendipitous discoveries. I urge all SETI workers to maximize the opportunities for accidental discoveries. Whenever one is wandering in the wilderness of unexplored territory, there is always the possibility of discovering something new and significant, perhaps unrelated to ETI. Be alert for new possibilities! Woody Sullivan suggested one example--radio sources that last only a few months. As another example of unexplored territory, I suggest looking for modulated or coherent signals--for example, audio-frequency amplitude or frequency modulation of known sources. The Crab Nebula pulsar was known as an optical star before its pulsating character was discovered. Are there any other such? With a natural explanation in mind, several investigators have looked for coherent modulation of OH and H_2O maser emission features. Discovering that a well-known radio source is actually a modulated signal from ETI would be almost embarrassing.

M. D. Papagiannis (ed.), The Search for Extraterrestrial Life: Recent Developments, 539–541.

2. INTERSTELLAR EXPLORATION

The scenario for interstellar exploration that I predict for our near future, say a few centuries, goes as follows. We begin, of course, by acquiring as much information as possible from Earth and Earth orbit. There's no doubt that we'll soon be able to detect planets around other stars. The next step is to send a probe to a nearby star for a flyby. We already know how to make such probes; we already know how to send probes out of the solar system; and we already know how to communicate across interstellar distances. We need only combine these technologies. I think this will be not too difficult. Even for the nearest stars the travel time will be long, say a century, and the round-trip communication time might be a decade.

A probe separated a few parsecs from its home will be largely on its own; moment-by-moment decisions must be made by on-board intelligence. We'll need to build some quite clever probes. As an analogy, we must carefully design the probe's genetic endowment; but away from home, it will need to have a mind of its own.

The next step would be a probe orbiter. I suppose we could use the multiple-flyby slingshot effect to get going out of the solar system and the same trick in reverse at the other end. But achieving an orbit requires, in advance, a rather detailed knowledge of the target planetary system and also more fuel. I predict lots of these orbiting probes, maybe one around each interesting planet in each of the target systems.

The next step would be a probe lander to plop down on likely planets and look around for creepy crawlers or whatever. One wag points out that such a probe landing on Earth would probably be run over by an automobile before it could figure out whether there's life.

My crystal ball is getting murky at this point, but I can imagine a probe that captures a few of the natives, dead or alive, and makes off with them back to the solar system. By that time, however, our probes may already be clever enough to send us all the information that we could get by direct inspection.

So what about interstellar travel by humans? I think we can do it if we want, but we'll need a motive. What can humans do that probes can't? I imagine more-and-more sophisticated self-replicating probes buzzing about the galaxy, but humans may just decide to stay home in the solar system. By the time we're able to explore or colonize planets around nearby stars, we may not want or need to.

If humans do go traveling among the stars, I'm fairly sure that the trips would be one-way. This follows the old adage that the farther you go, the longer you should plan to stay to make the trip worthwhile. If you're going really far, better plan to colonize.

These predictions are conservative in the sense that they require no new physical principles. Most of these ideas are just scaled-up versions of what we've already done in the solar system. New physical principles will be discovered, of course, and the effects will probably be even more outlandish than my predictions.

These extrapolations for our future for a few centuries are, alas, only marginally relevant to the ETI problem. Predicting our own

development for a few centuries is difficult enough, but we want to know about other civilizations which may be older than ours, not by centuries, but by eons. What we can do (or will do) in centuries, they could have (or will have) done eons ago. Limitations imposed by fundamental physics are important (I suppose, for example, the speed of light to be such a limitation); but limitations imposed on us by our federal budget or human lifetimes are, I think, irrelevant.

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