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Von Neumann's Probes And Their Implications For SETI

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Abstract. Despite a very widespread opinion, the possibility for an advanced civilization of building automatic probes to colonize the Galaxy would have negative implications for SETI. But it seems that this possibility should be excluded.

1. Possibilities on Colonization of the Galaxy

The Von Neumann's Probes hypothesis, i.e. the idea that the colonization of the Galaxy may be done through automatic self-replicating mechanical probes, instead of by intelligent living beings, has sometimes been considered as a possible way to enter in touch with ETs, complementary to the traditional SETI based on radio waves. On the contrary, such a hypothesis, if correct, would be fatal for SETI. Indeed, applying the well known Fermi Paradox to VNPs it follows that, if they can be constructed by an advanced civilization, and such civilizations do exist in the Galaxy, then VNPs should already be here. In fact, it is possible that, for various reasons, *some* civilizations decide not to use VNPs, or to program them excluding any contact with other civilizations, forever or for a while, until they reach a certain degree of technological development. But it is *very* unlikely that *all* the civilizations existing in the Galaxy do the same, if we assume, according to the Copernican Principle, that our place in the Universe is not special, but in the average. So, it follows that, if ETs exist and VNPs are possible, then at least *some* civilizations should have sent them, and thus we should already be in touch with one or more kinds of VNPs. Since it is not the case, then, according to the Fermi Paradox, either ETs do not exist, at least into our Galaxy (and therefore SETI can never succeed), or VNPs are impossible. Despite a very widespread opinion, I think that the second answer is the most probable one. VNPs, indeed, would be *very* advanced machines, probably the most advanced ones we can imagine. Now, any advanced technology requires very sophisticated instruments to find the exotic materials it is based on, and very complex machines to be built up. In turn, all those instruments and machines are produced by very similar complex processes, and so on. At the end of the story, we have to recognize that even to produce an ordinary personal computer (or any other similar gear) it is necessary nothing less than *our whole technological civilization*. In the same way, to reproduce themselves VNPs (which would be *much* more complex than a PC) would have to reproduce in advance the whole civilization (*much* more complex than ours) which created them, or, at least, a substantial part of it. It is very hard to understand how VNPs could do this in a time short enough to begin to reproduce

themselves before going all out of order. The only conceivable solution to this problem seems to be sending a *very* huge amount of VNPs, with an even huger amount of instruments and machines. But this would make the enterprise much more difficult than a mission with a crew of living beings. Also living beings, in fact, would have the problem of reproducing their whole civilization on the new planet they have landed on, before being ready to prepare another mission. But, at least, they would have not to wait for this in order to reproduce themselves! In other words, very likely the most efficient VNPs are intelligent living beings themselves. If so, these are bad news, since we can no more look at VNPs as a possibility to get in touch with ETs. But there are also good news. Indeed, if VNPs are impossible, then: 1) the absence of VNPs on Earth does not imply that ETs do not exist; 2) an invasion of hostile alien VNPs as a consequence of active SETI can be excluded; 3) more generally, this makes much more unlikely the possibility of a physical contact with an alien civilization as a consequence of active SETI, and, therefore, it makes active SETI much more likely not to be dangerous for us.

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