

The decoding problem:  
do we need to search for extra terrestrial intelligence in order to search for extraterrestrial intelligence?

Neil Tennant

Department of Philosophy and Center for Cognitive Science  
The Ohio State University, Columbus, Ohio 43210

## 1. ABSTRACT

There is a widespread and perhaps uncritically accepted assumption on the part of SETI researchers and popularizers that we could tell what an ETI might be trying to tell us. We raise difficulties for this assumption. If the assumption is abandoned, a lot follows. We might even be able to argue, in a novel way, that SETI will be utterly futile.

## 2. THE ASSUMPTION OF DECODABILITY

There are two aspects of the search for extraterrestrial intelligence — the technological and the philosophical.<sup>1</sup>

If there are higher civilizations out there in the Milky Way, perhaps they are continually broadcasting an *easily decoded* “Encyclopaedia Galactica” for the benefit of their less advanced neighbours. It may contain answers to almost all the questions our philosophers and scientists have been asking for centuries, and solutions to many of the practical problems that beset mankind.<sup>2</sup> (My emphasis.)

The concepts *telling* (or *asserting*), *understanding* and *content* form a crux that is arguably *the* most fundamental to modern philosophy. Philosophers have done important work clarifying and grounding our grasp of these concepts. It is work worth drawing to the attention of SETI scientists.

It can mislead the public, and unjustifiably drain the public purse, to hold out in all scientific seriousness *any* of the following prospects, without first giving some *very convincing conceptual analysis* and *plausibility arguments* based on such analysis:

1. the prospect of *communicating* with extraterrestrial intelligences, on the basis of strings of beeps alone, and without encountering them directly and being able to observe their communicative behaviour in the surroundings in which they are at home
2. the prospect of being able to *interpret* what they might purportedly be trying to tell us, on any electromagnetic frequency, at light years’ remove — that is, of taking a string of beeps as constituting a *monologue* endowed with a complex meaning that allstellar neighbours could recover
3. the prospect of being able to engage in a beep-string based *dialogue*, however fitful and protracted, with each parties’ contribution endowed with complex meanings recoverable by the other

## 3. THE DECODING PROBLEM

We are to imagine that we have received a long but finite sequence of beeps on some narrow channel on the electromagnetic spectrum. The beeps may vary continuously in duration, as may the “silences” that separate them.

*First question:*

Is the string of beeps a natural or intentional phenomenon?

It is to *this* question that the Arecibo software is addressed. If the answer is that the string of beeps is an intentional phenomenon — that is, produced by some alien intentional agency — then this will be an answer produced as a *default conclusion*. By this I mean that once we have exhausted all the naturalistic explanations available within the confines of our best astrophysical theories, we shall adopt the hypothesis that the string is of intentional origin; that is, that it has been produced by an ETI. A default conclusion takes one from failures to explain within certain constraints of simplicity and economy to a willingness to explain by recourse to less simple and less economic theoretical resources.

The postulation of an ETI as the origin of a string of bleeps is an example of such recourse.

*Second question:*

Given that the string of bleeps is an intentional phenomenon: are we eavesdropping on ETI's communicating with one another, or are we in receipt of an *alienable* signal? — that is, a signal *that some ETI, in sending it out, intends to have received by an ETI alien to it?*

I have no clear idea whether there are physical characteristics of a string of bleeps that could help one decide this question. But let us assume for the sake of our decision tree that the string of bleeps *is* an alienable signal in the sense just defined.

*Third question:*

Is the alienable signal one that is merely self-proclaiming, or is it one that is intended to convey complex, decodable semantic content to its alien receiver?

By a *merely self-proclaiming* signal I mean one whose physical characteristics have been designed or chosen so as to permit only the conclusion that it is an intentional phenomenon, but no more. Its net 'content' would be merely 'Hey, we are out here!' or 'Hey, you are not alone!'.

The conclusion that the alienable signal is *not* merely self-proclaiming, but rather has a complex, decodable semantic content, is *not* a default conclusion. Rather, it is the kind of conclusion that can only be justified by *convincing construction* — by constructing or exhibiting an instance, by way of inference to the best explanation, to justify a claim of the form "There is some so-and-so such that ...". In this case the conclusion would have to be a *decoding claim* — that is, a claim of the form

There is some optimal method of decoding (translation mapping into English or what-have-you) that is adequate to the observed evidence about this signal and others like it, according to which this signal means that *p*. In saying that it is optimal we meant that it has been arrived at *via* an inference to the best explanation of the observable data — it is simpler and more economical, hence better, than all rival methods of decoding.

where *p* is to be filled in with some propositional specification in English as to the content of the message.

Now let us take a closer look at the form of a decoding claim. One could in principle make a decoding claim about any and every utterance one processes in one's linguistic life. But as speakers of English we do not; we tend rather to adopt the identity mapping (also known as the *homophonic* mapping) as our translation mapping, and get on with our conversations. It is important to realise, however, that in our use of (our ideolects of) English, we could in principle have recourse to a decoding claim. You say to me "It is raining and cold outside." I conclude that it is raining and cold outside. I do so with a hefty *ceteris paribus* proviso: there is no evidence that you intend to deceive me, there is no evidence that you speak some strange language in which that form of words means something radically different from what it means in English, etc. etc. I am entitled to a decoding claim with regard to your string of sounds:

There is some optimal method of decoding (namely, the homophonic translation mapping into my ideolect of English) that is adequate to the observed evidence about this utterance of yours and others like it, according to which this utterance means that *it is raining and cold outside*

When we're all in it together we don't labour the obvious. *But if we think that an ETI is trying to tell us something, then what was so obvious among ourselves must be treated as very unobvious as between the ETI and ourselves.*

#### 4. WHAT IS NEEDED IN ORDER TO INTERPRET OR UNDERSTAND A LANGUAGE?

There is a vast philosophical literature and tradition of thought<sup>3</sup>, commanding widespread acceptance among modern philosophers, in support of the notion that meaningful linguistic utterances (hence meaningful sentence types) derive their meaningfulness or their meanings from *the ways that they are used by speakers in contexts in which they can be observed*. Even meaning skeptics<sup>4</sup> stress that it is *in despite of* all the observable behavioural evidence that they are

skeptical about meanings and univocal interpretations of linguistic utterances. And even innatists<sup>5</sup> of varying stripes concede that only through observation of others' behaviour (ontogenetically) is the individual's innate competence triggered and realised, and only through observation of others' behaviour (phylogenetically) could the innate mechanisms have been put in place by natural selection.

Let us put it this way:

*Meaning is ecological*

An utterance in a language that we do not understand, regardless of its length and complexity, will, if shorn from the context in which that language is used, if wrenched from the form of life that sustains its content, be like a fish out of water. It will not be able to function at all. As the fish gasps for breath, ironically in a surfeit of oxygen, so too a string of bleeps would go begging for content, even, ironically, when received by beings who convey contents to one another daily and who are all too willing to read content into what they see and hear.

Wittgenstein once wrote

If a lion were to speak to me in English, I would not understand him.

This may be taking things too far; but it is an extreme standpoint in the spirit of the thesis that meaning is ecological. Wittgenstein's point is that the lion's form of life is so alien to his own that interpretation of any apparently linguistic utterances from the lion — even if they appeared to be grammatical in English and appropriate in context — would be, in principle, impossible.

We do not need to share Wittgenstein's skepticism about leonine anglophonic unintelligibility in order to be skeptical about the prospects for decoding strings of bleeps from otherwise unobservable ETI's. As far as I am concerned, a lion who spoke to me in English, using grammatical sentences that were appropriate in context, would be a most welcome conversational partner. Very few *people* I know are capable of that much.

One should be willing to do the same for any ETI that were to come visiting. If the ETI got out of his spaceship and started speaking, like the lion, in what seemed to be grammatical and appropriate English, it would not take me long, after a little interaction with him (governmental agencies permitting) to be happy with the homophonic translation mapping.

It would strike us as a miracle as to how he/she/it/they did it (learned English, that is); but we would immediately start searching for reasonable explanations, and seeking out evidence to back them up. Had they been eavesdropping on our TV broadcasts, and did they thereby manage to interpret *us* along the lines, to be suggested below, that we might be able to interpret *them* by means of pictures? Did they visit some years earlier, and abduct some unfortunate English speakers who served as guinea pigs for *their* own project of Davidsonian radical interpretation of *us*? Or is it just an incredible cosmic coincidence? ... Maybe there are *so many* advanced technological civilizations out there that there is a non-trivial objective chance that, under pressures of natural and cultural selection, *one and the same* natural language could evolve in communities located on different planets! Even then there would be ticklish objections to overcome from the so-called 'wide content' theorists such as Hilary Putnam, deriving from their 'Twin Earth' thought experiments. They urge that meanings are constituted at least in part by the very nature and identity of the objects referred to by our meaningful expressions. If they are right, then the ETI's anglophonic natural kind terms would not be homophonically translatable on Earth — which would make the skepticism (about interpretability) for which I shall ultimately be arguing even more resilient.

Moreover, if (which is more likely) the ETI spoke to me in his own alien language (or otherwise tried to make himself understood — by forming neat patterns with his tentacles, and making rapid and syncopated proboscis movements), then I could set about trying to interpret what he *meant* by doing exactly what I would do in any of those situations that Quine describes as involving *radical translation* or that Davidson describes as involving *radical interpretation*.

I would record what he 'said' in what contexts. I would look for correlations between recognizably repeated sequences (of sound types or movement types) and recurrent features of the ostensible environment. I would try to discern *structure*

in his strings. I would try to work out how that structure affected meaning. I would try to work out what he could perceive, and what his sensory modalities were like. (Vision? Hearing? Sonar? ...) On that basis, I would make a guess at his basic perceptual beliefs. I would try to work out his hierarchy of goals, purposes, needs, desires, motivations. Coupling those with his likely beliefs, I would make a stab at why he would have said various things with conjectured content supplied by me, the radical interpreter. I would have to account for how that content was composed from the characteristic contribution of the repeatable portions of his utterances (the 'words', be they sounds or movements or whatever). I would have to show how, given the psychology posited, his 'sentences' made sense; and how, given the sense made by his sentences, his psychology was revealed as thus-and-so.

This is a very sketchy account of the procedure of radical interpretation. To summarize, it has two main interlocking and coeval components:

1. the postulation of an intentional psychology — involving, especially, perceptually based beliefs and organism-serving desires — that could be used to explain the creature's intentional behaviour
2. the postulation of *meaning* or *content* for types of linguistic utterances and their recurring portions. These meanings would have to be postulated in such a way that one could recover the meanings of whole utterances from the meanings of their parts. The meanings of the parts would arise from the systematic way in which they contributed to meanings of whole utterances in which they occurred.

In radical interpretation we may therefore speak of the *psychological* aspect and the *logico-grammatical* aspect of the decoding involved. Davidson goes further and enjoins a *principle of charity* governing interpretative attempts concerning alien *human* tribes, which I shall express as follows:

Ascribe such beliefs and desires to them as you yourself would have if you were living in their world, with access to the same perceptual evidence and life-sustaining resources as they have — that is, *maximize agreement* with regard to how you take the world to be, and how you would like it to be.

No doubt the principle of charity could still operate in the case of an alien creature visiting us on Earth. The main difference would be that we would have to conjecture what its sensory modalities were, and what features of the environment registered on its perceptual and cognitive apparatus. But if it appeared to function reasonably well here on Earth, going places and doing things, we should be charitable enough to think it had got some basic perceptual beliefs that were *true*; and which could provide a point of entry in the task of radical interpretation of those aspects of its behaviour that we took to be linguistic (that is, communicative in an intentional way).

Note that in all these cases where decoding or interpretation is possible, there are two main necessary features:

1. the utterances carry their meanings *immediately* in context
2. the utterances carry their meanings immediately *in context*

By *immediacy* here I intend the sense in which an utterance of an English sentence carries its meaning more immediately than would, say, its translation into Morse code for radio transmission. By *context* I intend the sense that involves the speaker or utterer as an essential part of a scene or situation, embedded within an environment and interacting with it, even if only by pointing at parts of it for didactic purposes while speaking slowly and clearly. Let us sloganise our two most recent observations about the cases where interpretation is possible:

1. we have immediate meaning
2. we have immersed meaning (that is, meaning is ecological)

Alas, with strings of bleeps from outer space, *we have neither*. We have no reason to believe that *they* converse with one another by means of strings of bleeps. For them, as for us, signals made up of strings of bleeps would in all likelihood derive their significance only indirectly, and not have immediate meaning. And we certainly cannot observe them in context as the signals emanate. All we get are the signals themselves, and no information at all about the natural context within which they originate.

How, then, might strings of bleeps from outer space ever mean anything to us? How could they have a complex semantic content that we might be able to decode?

## 5. HOW SEVERE IS OUR SKEPTICISM ABOUT DECODING?

### 5.1 The Principle of Super-Charity, or Anti-Cryptography

The SETI thought is this: if they're sending us signals, they *want* to be understood. They *intend* that we work out what those signals mean. So they are going to do everything they can to ensure that we catch on to what they mean. In short, they are going to think up some code that is really easy to crack.

This is a helpful and comforting thought only if we are not too moronic in comparison with them. After all, they may be so advanced intellectually that they have ceased to appreciate that what seems obvious to them might be terribly complicated for us. Can we rely on a higher intelligence being able to get down to the level of one with which it intends to communicate, and for whom it has to make its coding as simple as possible? Perhaps not; but let's suppose for the sake of argument that they're about as intelligent as we are and want creatures like us to cotton on to what they mean with their strings of bleeps. They have what appears to be an insuperable problem: how to *make themselves understood* in a perforce highly mediate way (for they don't bleep to one another) and a perforce unimmersed way. The problem is that of *proxy anabaptist* communication of content.

The odds are stacked against a solution. One can think of only the following two suggestions.

### 5.2 Recourse to pictures?

They might reason as follows:

It will be well-nigh impossible to secure a non-zero absolute probability of definitive interpretation of what we send them. There are just too many possible meanings that can be read off from any finite string looking for content both by proxy and anabaptismally. But we could make non-trivial the *conditional* probability that, *if* they see our message in the way intended, *then* it would be hard to imagine any rival interpretation fitting as well as the one hit upon. Take the most fundamental feature of the world as we experience it. It has three spatial dimensions and events take place in linear time. We can ignore relativity — everyone knows that life couldn't evolve on the scale at which relativistic considerations have any importance. Now any intelligent creature with a grasp of three dimensions would have a grasp of two; and a grasp of the concept of projecting from a three-dimensional region into a two-dimensional one. So perhaps we should send them a piece of code for the construction of a two-dimensional picture, or even for the construction of a three-dimensional one — like a sculpture. If they ever hit on it, they'll *know* they're onto the right thing, because the odds are so high against *that* being the outcome of just any old way of decoding.

So they pose for a group picture, even a video, and code up a nice fine mesh of pixels and beam it out, prefixed with some sort of clue as to how many rows and columns of pixels there are for each frame.

They are assuming that some ETI out there has eyes too, the better to decode their intended signals with. They are also taking comfort in the belief that some ETI out there can process frames at some appropriate speed like 32 per second and thereby get a phenomenological feel as of continuous motion continuously observed.

Hilary Putnam begins *Reason, Truth and History* with a philosopher's far-fetched situation of apparent but illusory meaningfulness. He imagines that a vast army of ants is crawling across a beach, and that from above they appear to form a picture of Winston Churchill. His point is that it would not *be* a representation of Winston Churchill, despite its miraculous likeness to him. This is because it is not the outcome of the right sort of *intentionality*, or world-directedness, on the part of the ants. The ants' behaviour is not rendered any the more intelligible by ascribing to them the collective intention so to render Churchill's face. We have a theory about ant-perception and ant-needs that is strongly grounded on knowledge about their physiology and other aspects of behaviour. And this theory does not allow for plausible extension by the hypothesis that they're up to some picturing tricks while scurrying across the beach. Notice the methodological moral: miraculous-seeming phenomenon drained of its apparent significance, because overwhelmed by a theory about the intentional limitations of the creatures producing it.

Perhaps not so with pictures from an ETI. I want here to register, but not dismiss, the bizarre-seeming possibility that an ETI might choose a pictorial method of communicating with us. The thesis would be that *if* we were ever so lucky as to hit upon the pictures immanent in a string of bleeps, *then there could be no other interpretation of them — they would have to be intending to convey those pictorial representations to us.* Bear in mind, though, that for us to be able to construe them *as pictures* the scenes or situations depicted would themselves have to be ones that we could grasp. I am thinking here of the possibility that they have bodies that we could recognise (from a picture — or better, from a movie) *as (locomoting or gesturing) bodies*; and that other physical objects depicted with them, even if we could not tell what kind of objects they were, were at least such that we could appreciate that there were at least some kinds of objects such that these objects were of those kinds. I am thinking here of alien artefacts and alien natural kinds; we might be able to recognise them for what they barely were, so to speak.

How would they code up pictures for us of their own scenes? Take a large prime number  $N$ . Square it. Send out  $N$ -squared as a series of bleeps, over and over again. Stay silent for some time. Then send out strings of  $N$ -squared bleeps and silences of equal duration, for the on-off filling of the pixels. How are they filled? Zig-zag? or repeatedly from left to right? or repeatedly from top to bottom? or spiralwise? It doesn't really matter, even in the three dimensional case. A good supercomputer could try out all the obvious ways. And when that group photo or sculpture of the ETIs leaps out of the screen or hologram-space at you, *bingo!!*

Note moreover that with moving pictures comes the possibility of *teaching us whatever gestural language* they may have devised. (I shan't comment on the possibility of decoding a *soundtrack* as well, because that's not as obviously *projective* as picturing. And sound is a very provincial phenomenon cosmically. Why think that they would have hearing systems, adapted to atmospheric vibrations, and that they would be hoping or assuming that potential recipients of their messages would have them too?)

Of all the suggestions I have come across, this one about recourse to pictures strikes me, as a philosopher of language, as the most plausible. And this is where my ruminations connect with the theme of this conference. For *if* I am correct, and *if* the boffins agree that the information for a video signal is better carried in the optical spectrum than it is in the radio spectrum, then it is optical SETI that should get the philosopher's backing. But one is tempted to wonder whether, with friends like these, the optical SETI advocate needs any enemies.

### 5.3 Concentration on the abstract?

Alternatively, they might reason as follows:

We can't tell them about material objects and secondary qualities and causal interaction and persons, because they can't observe us here, doing our customary things. So why don't we latch onto a subject matter that we can all appreciate without any need for ostensive language learning, and that we can reasonably assume to be universal among intelligences capable of receiving our signals in the first place? Why don't we signal to them about the most basic abstract mathematical objects that one can grasp as soon as one is equipped with the conceptual resources of identity and difference, and the ability to discriminate *different kinds of thing*, and *different things of one and the same kind*, regardless of *which kind* of things one's sense organs have been evolved to detect and one's cognitive apparatus has been evolved to think about?

They conclude, therefore, that they should communicate with other intelligences in the cosmos about the natural numbers.

Now doing *that* may be both easier and fruitless. We would not understand such abstract discourse unless already apprised of the abstract truths it expresses. This much is evident from just the problem of how one might identify their sign for addition, and for identity. If, for example, we had descried sub-strings of the form

blip blah blip blat blip blip  
blip blah blip blip blat blip blip blip  
blip blip blah blip blat blip blip blip  
blip blip blah blip blip blat blip blip blip blip  
blip blip blah blip blip blat blip blip blip blip blip

blip blip blip blah blip blip blat blip blip blip blip blip  
...

we might be tempted to interpret “blah” as the sign for addition and “blat” as the sign for identity. But *only because we already know the arithmetic truths*

\* + \* = \*\*  
\* + \*\* = \*\*\*  
\*\* + \* = \*\*\*  
\*\* + \*\* = \*\*\*\*  
\*\* + \*\*\* = \*\*\*\*\*  
\*\*\* + \*\* = \*\*\*\*\*  
...

Now of course the infix notation (according to which the addition sign is infix between the two numerals for the numbers being added, and the identity sign is infix between the two numerals making up the identity statement) might never have occurred to them. They might instead have developed only something like a Polish notation, and not be aware of any alternative to it. So they might send us something like the following instead:

blat blah blip bleep blip bleep blip blip bleep  
blat blah blip bleep blip blip bleep blip blip blip bleep  
blat blah blip blip bleep blip bleep blip blip blip bleep  
blat blah blip blip bleep blip blip bleep blip blip blip blip bleep  
blat blah blip blip bleep blip blip blip bleep blip blip blip blip bleep  
blat blah blip blip blip bleep blip blip bleep blip blip blip blip bleep  
...

The logically sophisticated among us will see this as:

=+s0s0ss0  
=+s0ss0sss0  
=+ss0s0sss0  
=+ss0ss0ssss0  
=+ss0sss0sssss0  
=+sss0ss0sssss0  
...

Again, we would only be able to make sense of it by virtue of already knowing the truths expressed.

So the prospect is that of being able to latch onto a formal lexicon and formal syntax *by using a great deal of our own knowledge* about the abstract subject matter. The question that then arises is: where would this get us? How, by recognising their communication as being about truths of mathematics, do we learn *anything else* about them, their life form, their biology, their own theories of the world, *from the strings of bleeps they send us?*

It wouldn't matter if they somehow managed even to convey to us the syntax of a formal language adequate for set theory, along with its axioms and a great many theorems. That simply wouldn't help. Precisely because of the abstract and necessary nature of mathematics, any message from an ETI that they intend to be interpreted as about mathematics *will be no more than self-proclaiming*. To be sure, what is proclaimed will be not just “Hey, we're out here”, but rather “Hey, we're out here, and what is more, we know some mathematics” — which will not be terribly informative given that they've got radio transmitters(or lasers) up and running. Indeed, even the barest self-proclaiming message “Hey, we're out here” has, as a pragmatic corollary “... and what is more, we have radio transmitters (or lasers)”. So to learn, on top of that, that they know some mathematics *as well* is hardly going to surprise us.

In the extant literature<sup>6</sup> on this problem — the problem of how to settle on an interpretation on the assumption that they're communicating truths that they assume us to know — one encounters remarkable philosophical naiveté. Extraordinarily optimistic assumptions are made about all of the following:

1. whether we would be able to work out which of the bleeps and pauses in a string of bleeps were symbol tokens or punctuation devices
2. whether the 'mean length of utterance' would be humanly tractable — that is, whether the 'sentences' within a string of bleeps would not be too long for us to work with
3. whether they would use *what to us seem like* 'canonical representations', such as a sequence of  $n$  bleeps to represent the natural number  $n$ . (Heaven only knows what they would do for the set abstraction operator. Devito and Oehrle blithely assume that they too would use precise analogues of *both* our semi-formal 'curly brackets with listing of members' *and* of our 'set of all  $x$  such that  $Fx$ ' notation.)
4. whether the 'sentences' would have anything like the syntactic and semantic structures with which we are familiar from our own grasp of our mother tongues, from pedagogical grammar, from theoretical grammar, and from the design of computer language and formal languages of logic — which, mark well, are nevertheless *for our own uses*. It would also help, of course, if the 'sentences' were *structurally unambiguous*, since we cannot appeal to context to help with disambiguation (as one would be able to, for example, with a question such as "Do we need to search for extra terrestrial intelligence to search for extraterrestrial intelligence?").
5. whether, if those 'sentences' have some sort of recursive grammatical structure underlying their repeatable constituents, the grammar would be *learnable* by *machines such as us*. I am here adverting to the vast literature on language learning — on inducing generative grammars from finite sets of data about grammatical and ungrammatical strings<sup>7</sup>.
6. (related to the previous point) whether the *thoughts* that they are intending to communicate with the 'sentential' sub-strings of bleeps would be structured in a way amenable to our metaphysical outlook — the outlook that assumes that there are individual things to be referred to and generalized about, and properties and relations holding of and among these things
7. whether they would order their 'interpretation tutorials', or 'primers', in a way friendly to the human intellect — first rehearsing mundane, singular arithmetical facts, then 'slightly more complicated' ones from a logical point of view, thereby allowing us to attain to a grasp of 'what counts as' a logical operator such as a negation sign or a universal quantifier; advancing, finally, to discourse (still interpretatively tutoring, mind you!) about the periodic table of the elements, the melting and boiling points of chemical substances, the curvature of space, Avogadro's number ...

The reader who feels her credulity strained should see the paper cited above by Devito and Oehrle. In a slightly more popular paper by the former author<sup>8</sup> we read (at p.14) the reassuring claim 'We can use our common knowledge [common, that is, to us and to the E'TI's], once we have identified it (*sic*), to rapidly reach the point where precise scientific information can be exchanged.' Devito overlooks the problem that the identification of common knowledge presupposes interpretative success. So the identification of supposedly common knowledge cannot be used to generate interpretative hypotheses. Later in the same paper (p.15) we find but one of many breathtaking claims: '... by sending our system of atomic weights and our value of the Avogadro number we enable our contractees to measure our gram for themselves.'

Sometimes it is difficult to resist the impression that such optimism, such gullibility, such lack of philosophical and skeptical restraint, is a transmuted form of a religious *willingness to believe* in the possibility of revelatory experiences — in this case, infusion of cosmic wisdom through miraculously uncluttered interpretative channels. One wonders how much of what might have been serious but ever self-doubting scientific speculation has become superficial and uncritical as a result of Carl Sagan's novel *Contact*. The following passage might easily be misconstrued by the skeptical reader as a sophisticated and merciless send-up of the 'interpretability *via* common knowledge' hypothesis. The President of the United States is hearing from her chief scientific advisor about the Vegans' recently decoded Message (in essence, another mere string of bleeps) on how to construct a Machine:

“... So with a few lines of text they’ve taught us four words: plus, equals, true, false. Four pretty useful words. Then they teach division, divide one by zero, and tell us the word for infinity. Or maybe it’s just the word for indeterminate. Or they say, ‘The sum of the interior angles of a triangle is two right angles.’ Then they comment that the statement is true if space is flat, but false if space is curved. So you’ve learned how to say ‘if’ and —”

“I didn’t know space *was* curved. Ken, what the hell are you talking about? How can space be curved? ... Okay, so ... You know how to say true-false, if-then, and space is curved. How do you build a Machine with that?”

“...Well, it just takes off from there. For example, they draw us a periodic table of the elements, so they get to name all the chemical elements, the idea of an atom, the idea of a nucleus, protons, neutrons, electrons. Then they run through some quantum mechanics just to make sure we’re paying attention — there are already some new insights for us in the remedial stuff. Then it starts concentrating on the particular materials needed for the construction. For example, for some reason we need two tons of erbium, so they run through a nifty technique to extract it from ordinary rocks. ... Don’t ask why we need two tons of erbium. Nobody has the faintest idea.”

“I wasn’t going to ask that. I want to know how they told you how much a ton is.”

“They counted it out for us in Planck masses. ... whole chapters of the Message are falling into our lap in clear.”

## 6. A TRANSCENDENTAL DEDUCTION OF THE CONCLUSION THAT, IF THEY’RE OUT THERE, THEY WON’T BE LETTING US KNOW

The famous Drake equation purports to provide the probability of intelligent, electromagnetically-signalling life elsewhere in the galaxy. I want now to enquire after the likelihood that an extraterrestrial civilization with radio or laser technology will broadcast semantically laden messages into outer space — messages that are not merely self-proclaiming, *and that we could understand*. It is my contention that *at least the conjunction of the assumptions enumerated above would have to hold in order for such interpretation to be possible*. So suppose further that  $p$  is the probability that the conjunction of the above assumptions holds. Then  $p$  is an extra diminishing factor that ought to appear in the Drake equation. The original Drake equation was for the probability (let us call it  $d$ ) of there being extraterrestrial intelligence in the galaxy. I propose that it be modified, so that it gives the probability  $D$  that there are such ETI’s *for whose messages there is the remotest possibility that we might understand them*.  $D$  is simply  $d$  times  $p$ . For the SETI zealot  $p$  will be of order 1. But for the philosophically sensitive skeptic,  $p$  will be more nearly infinitesimal.

A charitable assumption about any ETI capable of beaming signals to us is that they’re *at least* as smart as we are. Given that, it would follow that they are capable of reflective reasoning about the fundamentals of space, time, physical objects, matter, conceptual thought, numbers *and the nature of communication*. In all probability any other civilization out there will have produced a version of the skeptical argument above. They will realise that it is futile to devote resources to sending interstellar messages *that can only be self-proclaiming*. So they won’t do so. No-one could go calling, even if a call were to get through (for the distances involved are simply too great). Hence it would be futile for us to look for any calls. They, too, having reached a similar conclusion, wouldn’t be looking for any of ours. The extra infinitesimal factor  $p$  in the Drake equation disinclines them to take a gander.

But *we* are looking for *theirs*! So what is wrong with the reasoning above? ... or with us? Have we underestimated their intelligence? Down in Arecibo have we, in Austin’s words, merely equipped ourselves with some shining new tools that will not help crack the crib of reality? and which will turn out to be shining new skids under our metaphysical feet?

## 7. ACKNOWLEDGEMENTS

I am grateful for stimulating conversations with the Conference Organizer Dr. Stuart Kingsley, of Fiberdyne Optoelectronics, with Dr. John Billingham, Director of the NASA SETI Project and Professor Bob Dixon, Director of The Ohio State University’s ‘Big Ear’ Listening Project, and with my ex-student Clive Goodall, whose infectious enthusiasm made me take a skeptical look. I would also like to thank Alison Rayner for some hawk-eyed proofreading.

## 8. REFERENCES

1. Arthur C. Clarke, *Life* magazine, September 1992, p.68.
2. Arthur C. Clarke, *loc. cit.*
3. To cite just a few of the landmark works in this tradition: J.L.Austin, *How To Do Things With Words*, Oxford, 1962; W.V.O.Quine, *Word and Object*, MIT Press, 1960; J.Searle, *Speech Acts*, Cambridge, 1969; M.Dummett, 'What is a Theory of meaning? I' in S.Guttenplan, ed., *Mind and Language*, Oxford, 1975, and 'What is a Theory of Meaning? II' in G.Evans and J.McDowell, *Truth and meaning*, Oxford, 1976; J.Bennett, *Linguistic Behaviour*, Cambridge, 1976; D.Lewis, *Convention*, Harvard University Press, 1969; H.P.Grice, 'Meaning', *Philosophical Review* 66, pp.377-88, 1957; D.Davidson, *Inquiries into Truth and Interpretation*, Oxford, 1984, including especially 'Radical Interpretation' and 'Truth and Meaning'; P.F.Strawson, 'Meaning and Truth', Oxford, 1972; J.Barwise and J.Perry, *Situations and Attitudes*, MIT Press, 1983; C.Peacocke, *Thoughts: An Essay on Content*, Oxford, 1986.
4. S.Kripke, *Wittgenstein on Rules and Private Language*, Blackwell, 1982; S.Stitch, *From Folk Psychology to Cognitive Science*, MIT Press, 1983; S.Shiffer, *Remnants of Meaning*, MIT Press, 1987.
5. J.Fodor, *The Language of Thought*, Harvard University Press, 1979 and *Psychosemantics*, MIT Press, 1987; N.Chomsky, *Rules and Representations*, Columbia University Press, 1980.
6. The seminal work is Hans Freudenthal's *Lincos: Design of a Language for Cosmic Intercourse*, Part I, North-Holland, Amsterdam, 1960. More recent specimens of *Homo Freudenthalis* are C.L.Devito and R.T.Oehrle, with their article 'A Language Based On The Fundamental Facts Of Science', *Journal of The British Interplanetary Society*, Vol. 43, 1990, pp.561-568.
7. See S.Pinker, 'Formal models of language learning', *Cognition* 7, 1979, pp.217-83 for a survey of results in the field.
8. 'Languages, Science and the Search for Extraterrestrial Intelligence', *Leonardo* Vol.25, No.1, 1992, pp.13-16.