

Biolinguistics XXI: Semantics and Pragmatics

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I defend that the main task of language is to deal with intended meanings, and therefore that language should be centered on semantics and pragmatics. I propose a subjectivist program based on problem solving to achieve that conception of language. I argue that the predominant program of language, which is centered on syntax, is driving biolinguistics to a dead-end.

Keywords: biolinguistics, evolution, syntax, semantics, pragmatics, problem solving

§1 Disclaimer

¶1 · This is a philosophical paper. It has to be philosophical if semantics and pragmatics are going to be resolved in the XXI century, because that resolution requires us to resort to fundamental facts and first principles in order to determine the nature of meaning and intentionality conclusively. And yes, this is my forecast for the XXI century linguistics: semantics and pragmatics will be resolved.

§2 The first fact of psychology

¶1 · The object of psychology is also its subject.

¶2 · The epistemological split separates the subject, who is the agent observing, from the object, which is the patient being observed. In science, the subject is always a human being, abstracted as a mind, while each particular science has a different object: the object of biology is life, the object of astronomy is the sky, the object of geology is the Earth, and so on. Of particular interest here is that the object of psychology is the mind.

¶3 · Therefore, the subject of psychology is also its object: the mind. This is the first fact of psychology, because it derives directly from its definition.

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§3 Subjectivism

¶1 · A first consequence of the first fact is that, in psychology, we cannot obviate the subject. Being the mind both the object and the subject of psychology, obviating the subject would be obviating the mind, and obviating the mind would be obviating the object, but by then psychology would be void. This means that psychology cannot be an objective science.

¶2 · Unfortunately, by the XX century, objective science was such a huge success that the assumed conclusion was that science has to be objective. That conclusion was supported by the observation that what allowed science to progress from Galileo's time till the XX century was that objective measurements took precedence over subjective authorities, as the Bible or Aristotle. Then, for Popper, who gave the best definition of objective science, a theory is scientific only if the theory is falsifiable. This means that any scientific theory has to provide some objective statements, where an objective statement is one that refers to observations, or measurements when they are quantitative, that are not affected by the subject.

¶3 · In addition, and mainly after Newton explained the movements of both earthly and heavenly bodies with a single theory, the paradigm of objective science has been physics. And in physics, an explanation was a mechanism, like a clockwork or an automaton, where no action at a distance was involved. It is notable that Newton himself rejected the possibility of any action at a distance, "*hypotheses non fingo*", even though his gravitation was an action at a distance. This shows that, at least until Einstein, the ideal scientific explanation was a mechanism.

¶4 · Thus, we arrive to the XX century under the assumption that any theory that wants to be considered scientific has to provide a measurable mechanism. By that standard, no subjective science was considered scientific, and consequently Freud's psychoanalysis was not scientific and psychology was not a science. This together with the huge success of objective science put a lot of pressure on psychology. The result was behaviorism, which restricted psychology to the objective behavior of minded beings. For behaviorism, the mind is a mechanism inside the skull.

¶5 · Under behaviorism, psychology could be an objective science, that is, a proper science, by providing a measurable mechanism but, of course, given the first fact of psychology, this would restrict psychology nearly to null. That was what Chomsky (1959) argued: that language, understood as the set of all syntactically correct sentences, cannot fit within behaviorism. Chomsky's program was successful because, by that time, there was a better model for syntax than the mechanism, the computer.

¶6 · Computing has several equivalent mathematical models, such as the Turing machine, Church's λ -calculus, or Post's productions, which provided the corresponding mathematical tools to the theory of syntax. With this arsenal of new tools, syntax progressed rapidly after liberating itself from the strictures of behaviorism. Of course, this computational liberation was not limited to syntax, but it affected nearly all branches of psychology, and particularly cognitive science. For computationalism, also known as functionalism, the mind is a computer inside the skull.

¶7 · The computer is a more expressive model than the mechanism, and therefore some disciplines as syntax that did not fit into the mechanistic model were resolved satisfactorily within the computational model. That is, by being more expressive, computationalism provided psychology with more room to grow. This way computationalism became the

leading paradigm of psychology and its branches in the second half of the XX century.

¶8 · However, already in the XX century, some critics as [Searle \(1980 and 1992\)](#) and [Putnam \(1988\)](#) argued that meanings, consciousness, and in general intentionality, that are essential for the mind, cannot be modeled by computing, because computations are meaningless, syntactic, and lack any intentionality. In other words, they were arguing that the computer is as objective as the mechanism. And this implies that semantics, cognitive science, and in general psychology, cannot fit into any objective science, be it mechanistic or computational.

¶9 · We should note that avoiding semantics in the XX century was not only done in psychology and cognitive science. For example, in the introduction to his mathematical theory of communication, [Shannon \(1948\)](#) wrote:

Frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem.

I would not say that they are *irrelevant*, but they were for sure mathematically intractable within the computational model.

¶10 · Thus we finished the XX century going back to square one. Computationalism did not provide for a subjective science, as required by psychology. A revolution was pending.

§4 Self-reference

¶1 · One fact that is so obvious that is never mentioned is that science requires a language to express its theories. And then a second consequence of the first fact of psychology is that the language of psychology has to be self-referable. This is because, for the mind to be able to speak of itself, self-reference is required.

¶2 · Every human natural language that I know is self-referable, so I will generalize it: *every human natural language is self-referable*. This is an empirical statement that would be falsified should a counter-example were found. Please note that there would be impossible to translate the sentence “this sentence is false” to that counter-example, and that the speakers of that language would have difficulties for introspection. Then, such an impoverished language would have very few chances of being preserved in the struggle for language survival, and every chance to assimilate self-reference from any of its neighboring languages. So, I would only assign to such a non-self-referable language a very small probability and a temporal or transitory status.

¶3 · And complementarily, I will propose another empirical statement: *every non-human natural language is non-self-referable*. From these two empirical statements on natural languages self-referability, a demarcation between human and non-human languages follows directly: self-referability is the mark of human language.

¶4 · This demarcation is very broad indeed, and it gives the false impression that human language is just one step away from other animals communication systems. On the other hand, this demarcation is so close to the first fact of psychology that it requires a minimum of theoretical apparatus. In any case, you can find a finer demarcation in [Casares \(H\)](#), where other animals communication systems are asyntactic languages, and human language is a (Turing) complete language.

¶5 · In fact, human language is full referable, which includes being self-referable, because we can refer to any linguistic object. Thus, we can refer to the sentence “this sentence is false” just by quoting it, and, in the case of huge linguistic objects, we can use a name,

as we do to refer to the Bible, for example. Again, this simple conclusion, which is very near to the facts, admits two finer ones, which require more theoretical analysis:

- Self referability does not imply full referability. For example, primitive recursion allows self-reference but it does not achieve full referability.
- Every complete language is full referable, as shown in [Casares \(T\)](#), §2.3 ¶6.

¶6 · It could seem that psychology, requiring self-reference, is more demanding than objective science, which does not require self-reference, but it is not. The goal of objective science is to deliver theories that are completely free of any subjectivist bias. To achieve this goal, objective science requires that the subject does not affect its theories at all. And this implies that the capacities and limitations of the subject shall not affect the theories. The consequence is that objective science assumes an ideal subject without any calculating limitation who uses an ideal language with an unlimited expressive power. This is how objective science obviates the subject and the subject's language.

¶7 · The objectivist idealization worked properly in science until the XX century. This is not the place to further investigate this question, and you can go a bit deeper in [Casares \(I\)](#), but quantum mechanics and relativity reached the point where the subject affects the theories: the quantum measuring subject determines where and when the wave function collapses, and in relativity there is not an absolute frame of reference but one for each measuring subject. At this point in time, given the requirement of causal laws and Church's thesis, the most that science can require is a Turing complete subject using a complete language. And this is what it gets, in two words, full referability, which includes self-referability.

¶8 · I am digressing, sorry. The point is that, when the objectivist idealization does not work, because the subject cannot be ignored anymore since she affects the theories, then the language of the subject gets the focus. Language is of paramount importance when the subject cannot be ignored because, in science, the first mission of the subject is to express the theory. Only after expressing one, there is a theory that the subject can verify or falsify by making observations and measurements. Then, our summary so far is that a subjectivist revolution is pending, and that language will be at the center of that revolution. These are good news for linguistics!

§5 Revolution

¶1 · In this XXI century, we should expect a subjective revolution in science. We cannot assume anymore an ideal subject who can describe the whole universe precisely in her infinitely expressive language. In psychology, this was never the case, but psychology was deprecated because it was not an objective science. However, from the development of quantum mechanics and relativity in the XX century, physics is moving to subjectivism, though somehow reluctantly. And this will be a revolution because while the paradigm of objective science is physics, which is the science of objects, the paradigm of subjective science is psychology, which is the science of subjects.

¶2 · From this point on, we will have to take more distance from facts and first principles. The question is how to model the subject. Language is the main component of the subject, and though syntax was resolved by computing, semantics and pragmatics were not: meanings and intentions should be included.

¶3 · Please note that, in this context, to say that syntax is resolved does not mean at all that there are not syntactic issues pending, but only that computing seems to be

the proper foundation on which those issues will find a solution. And conversely, to say that semantics is not resolved does not mean that every semantic question that was already solved will be invalidated whenever semantics get resolved, but that by then those solutions should stand on a firmer base, hopefully. In other words, here we are only dealing with the foundations.

¶4 · My first proposal is to agree with Searle (1980 and 1992) and Putnam (1988): they were completely right in stating that a computation by itself has not any meaning. This is nearly the same as recognizing that computing resolved syntax but not semantics. Unfortunately, both Searle and Putnam are just negative, they say that computing has no meaning but they do not provide us with any source of meaning, and we need urgently one, or otherwise the revolution would stop here.

¶5 · I think that to identify the source of intentionality and meaning is the crucial step towards the subjectivist revolution. The proposal is that of

▷ *intentional life: life is the source of intentionality and meaning.*

Then every living being is an embodied intention.

¶6 · The intentional life proposal is in line with the biolinguistics program and, I hope, it will not be very difficult to accept, because lifeless objects are not intentional. However, even if this is the crucial point, declaring life to be the source of intentionality and meaning would be inefficient if the very concept of life could not be grasped. And life is a slippery concept, indeed. We need some way to comprehend the concept of life.

¶7 · In order to grasp the concept of life, I will identify life with the problem of survival. The proposal now is that of

▷ *problematic life: life is the problem of survival and evolution is its resolver.*

The problematic life proposal requires a mathematical theory of problem solving, you can find my attempt in Casares (P), to model life as a problem and evolution as a resolver. For this theory, to resolve a problem is to calculate its solutions, and then a resolution is an algorithm, that is, a way of solving the problem.

$$\text{Problem} \xrightarrow{\text{Resolution}} \text{Solution}$$

However, instead of doing any mathematics here, we will try to understand how meaning and intentionality fit with these two proposals.

¶8 · If life is the problem of survival, then the final intention is to keep being alive, or not to die, and the final meanings are *life* and *death*, which solve and not solve the problem, respectively. All other intentions and meanings propagate from these final ones, because the survival problem is the trunk of a tree of problems. The survival problem tree is composed of several sub-problems, such as eating, mating or healing, that are further composed of sub-sub-problems, and so on, in the end all of them helping to resolve the survival problem in different circumstances and degrees. An intention corresponds to each problem in the tree, and each problem gives meaning to its prospective solutions, resolutions, and sub-problems.

¶9 · Under our proposals, Searle (1980) following instructions inside his Chinese room can give meaningful answers in written Chinese to questions given to him in written Chinese, while he understands neither the questions nor the answers. But Searle is just following

instructions, so the answers are not meaningful *for him*. It is for the Chinese speaking person who is asking the questions to solve her problems for whom both the questions and the answers are meaningful, because they can help her in solving her problems, which are ultimately sub-problems of her survival problem. In the case of Searle, not understanding Chinese, the sentences in Chinese are meaningless for him because they cannot help him to solve his survival problem. This shows that meaning is subjective.

¶10· Meaning is subjective because it is woven into the problem tree of each subject. And attended problems change depending on the circumstances. This explains why defining a simple thing such as a chair can be ultimately impossible. In a sense, when one needs to sit down desperately, then nearly everything counts as a chair. However, in more favorable circumstances one would be choosier. This shows that intentions affect meanings, which is to say that semantics depend on pragmatics.

¶11· Summary: in the previous sections we have identified the need of a subjectivist revolution in science, and in this section, with the aim of implementing that revolution, we have made two proposals in order to model the subject. The intentional life proposal says that intentions and meanings are biological concepts, and the problematic life proposal says that problem solving is the proper model for biology. Our bet here is that this program will be able to resolve semantics and pragmatics in the XXI century, as syntax was resolved by computationalism in the XX century.

§6 Syntax and language

¶1 · If we are right, then a consequence of the subjectivist revolution would be that linguistics will be less centered on syntax than it is from the second half of the XX century. Syntax is now at the center because of its success, but I think that a more balanced linguistics will be better, because language is much more than syntax. In this section we will try to see how the problematic life proposal could change that balance on linguistics.

¶2 · For example, syntax can hardly discriminate between these two sentences:

(1) My hat is red.

(2) This sentence is false.

Both are syntactically right, so a meaning can be assigned to each one. Having both the same syntactic form, both construct its meaning the same way: a thing is specified and a property is attributed to it. But after the syntactic pre-processing, the semantic and pragmatic calculations differ greatly.

¶3 · At first sight, and in spite of what we have said above, the meaning of sentence (1) does not seem to be related to my problems, but depending on the context it can be the case. If I need something to protect my bald head from the sun, and I have asked you to pick my hat, then its color red can be what you need to know in order to help me to solve my problem. In a different context, its intended meaning could be that I use the Linux distribution named Red Hat to resolve those of my problems which a computer can help me to solve. And without any context, it has a standard meaning. The standard meaning is not related to my current problems, but it could be useful in the future to solve them. This is a consequence of a survival strategy we use: we accumulate meanings just in case.

¶4 · Sentence (2) is a classical paradox. If sentence (2) is true, then it is false, and if it is false, then it is true, and then is false, and then true, and so on and on. The calculation of sentence (2) does not *halt*, because it enters an infinite loop, so its meaning does not

stabilize. Paradoxes have useless meanings, they cannot be used to solve any problem, and then they are the zeroes of pragmatics.

¶5 · Let us look now to the following pair of sentences, where you asked me question (3), and I answered (4):

(3) Who is in Mallorca?

(4) Ramón.

Oops, is (4) really a sentence? I cannot say, but what I can say is that the standard meaning of the pair is ‘Ramón is in Mallorca’, and, what is much more interesting, that that meaning was not produced by a single person, but by two of us, you and me, in collaboration. The point here is that syntax is a single person business, and then it is blind to cooperation and to other interpersonal situations.

¶6 · Therefore, in a linguistics centered around syntax, declarative language will be favored over interrogative language. I have not concrete data, but I guess that this is the case currently. A consequence is that language as a tool for thinking is favored over language as a tool for communication, because interrogative language gives its focus to the cooperative mode, where language is a tool for communication, while in the declarative mode language is a tool for thinking. Another consequence is that written language is favored over spoken language, because written language is mainly declarative, since it is mainly unidirectional, while spoken language is mainly interrogative, since it is mainly bidirectional.

¶7 · In a more balanced linguistics, sentence generation is just a post-processing stage needed to adapt the intended meaning to the serial communication channel, and sentence parsing is just a pre-processing stage needed to reconstruct the intended meaning. We assume Church’s thesis, so meanings and intentions are also the result of brain computations, but while syntactic computations are only concerned with the adaptation of the message to the communication channel, following the non-semantic model of Shannon, semantic and pragmatic computations deal with the subject problems. Therefore, the bulk of the calculations are not the syntactic computations, but the semantic and pragmatic computations that calculate meanings with the intention of solving problems.

¶8 · A more balanced linguistics will be a better linguistics. In a more balanced linguistics, syntax is just a formatting stage needed to adapt the message to the channel, and this is a technical problem that can be resolved disregarding semantics and pragmatics, as shown by [Shannon \(1948\)](#). But then, syntax is the wrong place from where to assess the value of language.

§7 Biolinguistics

¶1 · According to [Dobzhansky \(1973\)](#), “Nothing in Biology Makes Sense Except in the Light of Evolution”. This strong link between biology and evolution requires that any appropriate model for life has to accommodate evolution naturally. An argument in favor of the problematic life proposal is that it fulfills this requirement easily.

¶2 · Biolinguistics is firmly based on the fact that language is a product of biology. For that reason, Dobzhansky’s statement applies directly to biolinguistics: language is a product of evolution. Therefore, the scientific theory explaining language has to be evolutionary, or in other words, language requires an evolutionary explanation. Consequently, in order to explain language evolutionarily, we should determine the survival value of language and then, on that basis, we should provide a rule to assign a fitness value to each possible language.

¶3 · We use language both for thinking and for communication. Under the problematic life proposal, thinking is resolving problems individually, and communicating is resolving problems cooperatively, and therefore to resolve as many problems as possible is as valuable for thinking as for communication. Then language is a tool for expressing problems, resolutions, and solutions, and this is its survival value.

¶4 · For example, the language of vervet monkeys consists of a three alarm calls, one for leopards, another for snakes, and the third for eagles, where all three are vervet predators, see [Seyfarth et al. \(1980\)](#). In this case each call expresses a survival sub-problem, which has a predefined resolution, that is, a predefined way of solving it. As each problem has a predefined resolution, then we can also say that each call expresses a resolution. In any case, the expressiveness of the vervet language is three, because it can express three meanings. And then we will relate language expressiveness with fitness, because it seems sensible that expressing more meanings would save life in more situations. In other words, we assume that language expressiveness has a direct relationship with evolutionary fitness: more meanings, higher fitness; less meanings, lower fitness.

¶5 · Assuming Church's thesis, meanings are the result of computations. And then the complete languages of Turing complete devices are the most expressive languages, because any computation can be expressed in the complete language and calculated by the Turing complete device. This explains evolutionarily why human language is complete, see [Casares \(H\)](#). But, in addition, there is a huge language gap between other species communication systems, which have little expressiveness, and human language, which is completely expressive. Can we also explain this gap evolutionarily?

¶6 · A related question is: Why is human language the only complete natural language? Why only us? Our answer is based on the different requirements of cooperation and competition, where cooperation happens when two or more individuals share a problem that they are resolving together, that is, when they share a common intention. Now, the answer. Complete language has a very high fitness, because it allows the living being having this trait to resolve verbally, that is cheaply, whatever can be resolved physically, which is much more expensive. But communicating true information, which is essential in cooperation, is nearly irrelevant in competition, and evolution is basically competitive; remember that evolution is "the struggle for life". Then, as [Tomasello \(2008\)](#) argues, in pages 341–342, no language would evolve for competition, or conversely, only in a cooperative environment can language evolve. Therefore, our explanation is that some of our ancestors were in a very infrequent evolutionary environment that fostered cooperation, and that within that environment a series of increasingly expressive languages evolved; see [Casares \(T and H\)](#) for some more details.

¶7 · According to Dobzhansky's dictum, evolutionary explanations of language should be the core of biolinguistics. And this section aim was to show that, capitalizing on the intentional and the problematic life proposals, we can determine the survival value of language, we can assign a fitness value to each particular language, and then, on that basis, we can explain evolutionarily why human language is complete and why *only* human language is complete.

§8 Conclusion

¶1 · This paper started with a philosophical opinion: that the objectivist idealization has already found its limits. This is a negative opinion, because it says that objectivist science cannot progress anymore, and just a negative determination is never enough. What is needed is a new path to progress further. And, as we have argued above, the language of the subject will be the key to open this new path, so linguistics will be its foundation; particularly biolinguistics, which is what the intentional life proposal is saying, though in an abstract way.

¶2 · The problematic life proposal is, well, problematic. But the future is always unknown, so you should have to judge it for yourself. Of course, those of you who had invested more resources on the current program will lost more than younger linguists, but you are also in a better position to assess the limitations of current biolinguistics. So let us examine the most authoritative explanation of the evolution of language given from current biolinguistics. I am referring to the book *Why Only Us: Language and Evolution* by [Berwick & Chomsky \(2016\)](#). The book assumes explicitly, in page 70, that language is the result of a single minor mutation, which was preserved because of its selective advantage, page 80. They never explain the ‘only’ part of the title, perhaps because it is trivial: such a mutation only happened to one of our ancestors. The implication would be that we have evolved language by a double stroke of very good luck.

¶3 · This is the kind of argument that feeds creationism. If an event with a probability zero is the very definition of a creative event, then an event with a probability approaching zero, and precisely happening in the origin of language, which is arguably the most definitional human characteristic, is pointing directly to a creator. This is, in my opinion, why the single minor mutation explanation of language was not very much welcomed by evolutionary biology. But this is just science politics; language could have been the result of pure luck, although it is very unlikely.

¶4 · Another point is that a single mutation causing language would put biolinguistics into a dead-end. That is, if language is the result of a single mutation, then it is as it is, and it is luckily preserved because it happens to have a selective advantage, but we cannot say anymore about language evolutionarily. Why is it syntactic? The lucky mutation turned language that way, and it was luckily preserved. Why is it generative? The preserved mutation cause it to be like thus. Why is it hierarchical? Why is it complete? The same answer applies: because of a double stroke of very good luck. That situation would be very inconvenient for biolinguistics, but it does not show that it is false, it only shows that, in that case, biolinguistics could not provide any evolutionary explanation for language.

¶5 · However, what if it could be shown that syntactic languages are more expressive than asyntactic languages, that generative languages are more expressive than finite languages, and that complete languages are the most expressive languages; see [Casares \(H\)](#). Then we could determine some milestones in the evolutionary history of language, providing some missing links that otherwise might be demanded by anti-evolutionists. It would be much more convenient and explanatory, of course, but is it enough for a revolution?

¶6 · The argument by [Berwick & Chomsky \(2016\)](#) is that language is so simple that a slight rewiring of the brain caused by a single minor mutation is enough to explain it. In [Casares \(M\)](#), I have defended that language is not so simple, but here we should discuss the philosophical consequences. My fundamental complaint against that argument is

that they identify language with syntax. When they say ‘language’ they are referring to ‘syntax’, because they exclude from their explanations whatever is beyond the semantic-pragmatic interface. So their evolutionary explanation of language excludes semantics and pragmatics and it is purely syntactic.

¶7 · On the contrary, in my opinion, the central task of language is to deal with meanings. But, since meanings are intractable, Berwick & Chomsky do what Shannon did: disregard as irrelevant the semantic aspects of language. This bias is called the streetlight effect:

— *Did you lose the keys here?*

— *No, in the park, but the light is much better here under this streetlight.*

We can disregard semantics when the meanings are irrelevant, but, in communication, what would be the use of transmitting meaningless messages? And, in language, what would be the use of dealing with meaningless sentences? And then, in evolution, what would be the survival value of non-semantic language? The answer to these three questions is ‘none’.

¶8 · My conclusion is that, after ignoring meanings and intentions, the survival value of language would be zero, and then language could not get an adequate evolutionary explanation, putting biolinguistics into a dead-end. However, the main task of language is dealing with intended meanings and then meanings and intentions cannot be ignored. I think that a subjectivist revolution based on problem solving is required to give semantics and pragmatics their leading rôles in linguistics, but in the end it is up to you to decide whether or not this revolution is needed. Would you join our subjectivist revolution? Will you?

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