Esperanto: a counterexample to the very idea of formal natural language semantics?

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"It's like learning a new language Helps me catch up on my mime" – Interpol¹

Abstract

Esperanto and formal semantics are incompatible. This is the fault of formal semantics, not Esperanto. This point holds for any language for which there is not abundant evidence. Formal semantics should meet this challenge because it would enrich its theorizing and practice – with respect to commonly studied languages such as English as well.

THESIS

It is impossible to account for (a fragment of) Esperanto in a rigorous, formal semantics.

Argument

Formal Semantics is Anglocentric, albeit for sociological reasons. A limitless supply of usually convergent semantic judgments is available as input to the effort of formalizing fragments of the semantics of English.

On the other hand there is the situation with dead languages such as Latin and Ancient Greek, where no such data is forthcoming. In such cases hermeneutics and educated guesswork is all we can rely on – objectively surface forms are the only hard evidence, which must be studied together with circumstancial evidence, viz. archeology. When we as humans struggle to understand such languages from a first person, philological perspective,² why bother attempting a third-person, formal account of them? Such an account will most likely be unfalsifiable, let alone useless, since the point of studying historical texts and languages is primarily understanding texts in their context, whereas formal semantics aims at producing a context-free literalist denotational (contrasted with connotational) mapping of arbitrary word forms to 'meanings;^{'3}

Esperanto (Zamenhof, 1905) has a sufficient amount of speakers⁴ — a critical mass which is a necessary condition for a language to thrive and to enable a general linguistics treatment; i.e., the number of speakers and corpora⁵ are extensive enough for representative samples and statistically significant conclusions on naturalistic data. Despite that, its speakers are mostly second language (L2) speakers, which reflects adversely on the reliability and density of speaker intuitions. Since there is no geographically concentrated community of first language (L1) speakers which develop the language continuously and intensively (which is what happens when a language $Creolizes^6$), no extensive, fine-grained intuitions on marked constructions be it syntactically, semantically or pragmatically - have developed, especially not for more fanciful

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¹ from the song "Leif Erikson," on the album *Turn on the bright lights* (2002), label Matador.

 $^{^{2}}$ e.g., knowledge of collocquial Latin is based on a single remnant work: the Satyricon

³scare quotes are called for because meaning in formal semantics has a very technical and specific sense, which is arguably of negligible interest to real understanding (this provocative claim should be the topic of another essay or dissertation). ⁴estimated at 100.000 to 1 million (Sikosek, 2003)

 $^{^{5}}$ The Tekstaro corpus (Wennergren, 2010) currently consists of about five million words from both literature and magazines.

 $^{^{6}}$ cf. Haitao (2001) for an argument that Esperanto should be contrasted with both pidgins and Creoles

or exotic constructions, which is a precondition for a 'crucial experiment' determining their membership or (relative) felicity in the language. This is a problem generally for formal linguistics (Miner, 2010; 2006), and specifically for formal semantics, which necessarily attempts to give a clear and precise account of a fragment of natural language, viz. a rational reconstruction (axiomatized theory).

Semantics of Esperanto requires a battery of evidence which may very well not reduce to a neat formalization such as implicitly envisioned for English by formal semanticists — e.g., the seminal Montague (1974), which serves as a model of elegance and formality to formal semantics. (Gamut, 1991)

Specifically this threat exists because of the curious situation and status of Esperanto. (Miner, 2010). Generally this is because current formal semantics has a tunnel vision which ignores the arguably stochastic nature of natural language (Bybee, 2006) semantics; knowledge of semantics seems to be continuous with world knowledge – I would be surprised if philosophers (or men of science⁷ for that matter⁸) could succeed in finding a clean break which allows them to rigorously isolate semantics in empirical data. Formal semantics suffers from undergeneralization – lots of interesting data are available but a coherent theory is not forthcoming.⁹

A reading comprehension experiment could reveal how underspecified Esperanto truly is, in practice. My intuition is that Esperanto relies more on context than on linguistic resources such as markedness, compared to ethnic languages with stronger cultural transmission (ratchet effect, cf., Tomasello (1999)), but that despite this it is an effective tool for communication (which is what century long practice seems to show).¹⁰

Esperanto has relatively little polysemy, because of the principle one root, one sense, just as it follows one spelling, one pronunciation for phonology. In Zamenhof's own words:

> "La lingvo Esperanto estas kreita en la sekvanta maniero: estas prenitaj la plej konataj vortoj de la lingvoj arjaj kaj tre garde preparitaj tiel, ke ili alformiĝu al absolute regula gramatiko, ortografio kaj praktika uzebleco, kaj ke la vortoj kaj

formoj ne venu en kolizion unu kun la alia." – cited in Wells (1989)

My translation: "The language Esperanto was created in the following manner: the most well known words of the of [Indo-European¹¹] languages were taken and very carefully prepared in such a manner, so that they should conform to an absolutely regular grammar, orthography and practical usability, and so that the words and forms would not collide with one another."

The set of distinctions that Esperanto makes lexically is unique and large compared to other Indo-European languages. (Miner, 2010). Wells (1989) lists the following examples of paronyms: *akordi-agordi, konscio-konscienco, generalo-ĝeneralo* (accord-tune, consciousnessconscience, (army) general-(adjective) general – my translations with the help of the Reta Vortaro).

Generative linguistics assumes the competenceperformance distinction, just as structuralism follows the distinction between *langue* and *parole*, respectively. Linguistics, according to these two theories at least, should study only the second of these two pairs. The way to get at it is with recourse to speaker intuitions, for example judgments of grammaticality or meaning. Initially these intuitions were considered the only reliable source of data about the presupposed abstract rule system that is grammar, since it was hypothesized that actual language use is riddled with performance errors: disfluencies, ungrammaticality, etc.

Contrary to this are the findings in psychology demonstrating that **introspection is an unreliable source of data**:

> "[I]ntrospection does not provide a direct pipeline to nonconscious mental processes. Instead, it is best thought of as a process whereby people use the contents of consciousness to construct a personal narrative that may or may not correspond to their nonconscious states." – Wilson and Dunn (2004); also see Nisbett and Wilson (1977); Wilson (2002).

⁷I employ this term because 'scientist' is an opaque derivation, a "person who deals in knowledge" is much too general; transparent derivations are a thing of beauty. Needless to say, men of science should be read as men and women of science; classical collocations may be a sacrifice to political correctness, but quid ad me!

 $^{^{8}}$ I subscribe to Naturalism which submits that philosophy is (or should be) continuous with science

 $^{^{9}}$ Undergeneralization is of course a very general problem of neuroscience and to an even greater extent psychology. 10 Cf. attestation of this by non-Esperanto speakers such as Eco (1995); Phillipson (2003), and, needless to say, Esperantists themselves (Jansen, 2010).

 $^{^{11}}$ The original says "Aryan" – in all likelihood written decades before *Mein Kampf* was published (1925) since Zamenhof lived till 1917.

Another problem is that there can be no independent corroboration if the researcher starts with intuitions and (only) verifies these with yet more intuitions (Stokhof, 2007) – however data about meaning are verified, there is no direct evidence to be had, save perhaps for a neural correlate, which is not feasible as of yet.

When linguistics (and hence semantics) employs corpus studies and questionnaires coupled with sophisticated statistical approaches, it has **more empirical leverage, and hence more potential for success**. However, the problem that will rear its head is that of integrating disparate sources of evidence, and the fact that there may be lots of it (e.g., the BNC corpus is 100 million words). A neat, parsimonious theory may not obtain. Then there is the problem of sparsity, which is especially relevant for endangered languages. Humans seem to have powerful generalization strategies to deal with such situations, as evidenced by the fact that it has been possible for anthropologists to learn the language of natives without the help of any common language.

Empirical rather than *a priori* approaches to semantics are available in the form of Distributional Semantic Models (DSM), such as Latent Semantic Analysis (LSA, Griffiths and Steyvers (2002)), which exploit statistics and word co-occurrences to reveal information such as semantic similarity in a truly unsupervised way (i.e., not biased by a priori linguistic theorizing), since they only exploit the concordances of surface forms in corpora. But also in this case the corpora need to be carefully chosen, which is challenging in Esperanto since speakers come from different backgrounds and may be at odds with each other¹². It goes without saying that it is possible to let DSMs loose on the whole literature of Esperanto, but there is undoubtedly a similar kind of diglossia between written and spoken communication as attested in other languages, which makes such a project less general than desired for a complete semantics.

Stastically it should be conjectured that an exclusively L2 language such as Esperanto needs stronger independence assumptions than a language for which an exstensive collection of marked constructions is handed down through generations. Although this speaks to the high degree of

compositionality (Janssen, 1996) in Esperanto (Schubert, 1993) – which is good news for formal semantics which delights in such systematicity – stochastically this means that stronger independence assumptions come into play (Prescher et al., 2004), as the fragments of exemplars that are combined are smaller, thus requiring more fragments for a single derivation, with less corroboration by spurious derivations using fragments of different sizes (since in the limit the fragments are words or context-free grammar rules, which is the case when both a) the principle of compositionality holds unconditionally and b) when the lexicon is neatly composed only of words). This data sparsity is not problematic for international communication and literature, as evidenced by the century long practice of Esperanto, but it could become problematic when a language is stressed by the scrutiny applied in court rooms and close readings.

Formal semantics commonly assumes that semantics is universal, be it tacitly or explicitly, whether it is for particular, supposedly language independent function words, or in the search for semantic universals such as in Generalized Quantifier theory (Barwise and Cooper, 1981). This assumption is unwarranted, as work in comparative linguistics shows that the idea of universals is widely discredited by empirical evidence, among which there is semantic evidence as well. (Evans and Levinson, 2009); moreover, Esperanto sheds light on it from a unique angle (Koutny, 2010), although not enough data has been collected yet to draw firm conclusions.

The model-theoretic (e.g., Montague (1974)) and the dynamic (e.g., Groenendijk and Stokhof (1996)) varieties of formal semantics assume that semantics can be captured in Logical Form $(LF)^{13}$, which amounts to assuming an ideal language (Stokhof, 2007). Contrary to this are mentalistic such as in generative grammar or in Discourse Representation Theory (DRT, Kamp (1988)) which assume not an ideal but a mental language – an equally problematic assumption from an empirical point of view, since there is absolutely no data on the general form of mental representations – nay, the very idea of mentalism is philosophically up for discussions (Rorty, 1979). The history of constructed languages

 $^{^{12}}$ Wim Jansen (personal communication) informs me that there seem to be convergent intuitions on frequent and basic constructions among speakers from different backgrounds, but that intuitions are less clear for potential constructions which are not widely attested (e.g., clefts).

 $^{^{13}}$ As an aside: Schubert (1993) mentions fascinating parallels between logic and the emergence of Esperanto; e.g., the logicians Peano and Couturat both play a role in Esperanto history, although they have demoted themselves to footnotes by proposing their own languages. Generally there is a strong historical connection between the *zeitgeist* of Logical Positivism and the thinking of early Esperantists, which should form the topic of another essay or dissertation, if it does not exist yet – the fact that Esperanto survived but logical positivism (arguably) did not seems to point to the importance of pragmatism, but that is a very speculative thought. In addition, there is a link of seminal linguists to Esperanto, to wit: Otto Jespersen (who discovered the Great Vowel Shift, for example), the brothers de Saussure, John Wells (of IPA fame), etc.

shows, if anything, that ideal languages fail (Maat, 1999), and "informal" (more naturalistic) languages succeed¹⁴, when human, spoken communication is concerned.

Concerning the nature of mental or neural representation, there is convergent evidence in cognitive psychology and neuroscience (Simmons et al., 2008) supporting the Dual Code theory (Paivio, 1971; 1986), which posits that there are two kinds of representations, linguistic and perceptual, or amodal and modal, respectively. The language and situated simulaton (LASS) theory (Barsalou et al., 2008) claims that these two codes are linked with the help of simulation. If true, and all evidence points in that direction, these claims will shatter the hopes¹⁵ of cognitivists and truth functional semanticists alike, for their notions of logical form are deeply and exclusively amodal. The form in logical form refers to the manipulation of uninterpreted symbols, while dismissing the modal representations on which humans seem to be reliant. Esperanto fits into this picture as just another spoken language, albeit with less data points in these two codes. However, this is a relative, not a categorical difference, as compared to ethnic languages. Precisely the same methodologies for studying these representations for ethnic languages apply to Esperanto.

Miner (2010) raises fascinating questions as to the normativity of a language without native speakers. In his seemingly structuralist opinion normativity without native speakers simply does not obtain. I beg to differ, as the experience of Esperantists from wildly different backgrounds seems to show that norms may be negotiated dynamically, which allows the language to evolve (albeit slowly as a consequence of its relatively nonintensive usage). Miner's point about negative evidence being absent is of course correct, but I do not see why Esperanto is a special case in a crucial way. Negative evidence is always a nebulous concept in philosophy and science, and solliciting judgments from speakers, be they native or not, does not solve this. Note that in modern Bayesian approaches there is actually no principled difference between positive and negative evidence, absence of evidence is detected and exploited to learn what children supposedly 'could not have [...] learned from experience' (Regier and Gahl, 2004).

Children acquire native languages without any considerable negative evidence (MacWhinney, 2004), why should linguistics be any different in this regard? The fact that the judgments of L2 speakers are less authoritative (I refuse to consider this distinction as categorical) does not detract from the apparent fact that they *exist*, and thus should be exploited in an empirically responsible theory. Judgments can be aggregrated according to voting theory and sophisticated statistical methods, forming a committee of more or less expert informants. This is of course more work than the arm-chair linguistics that current L1 speakers and researchers are endeavoring, but it should be well worth the effort if the aim is to get a more complete and trustworthy picture of a language.

CONCLUSION

Esperanto and formal semantics are incompatible. This is the fault of formal semantics, not Esperanto. This obstacle generalizes to other languages without native speakers or abundunant data, and is a challenge to formal semantics that is not being addressed in mainstream work in formal semantics.

Much work remains to be done for an *intellectual* theory of everything,¹⁶ in which meaning should be a first-class citizen; although this will be the task of neuroscience and possible psychology, formal semantics should play the important role of systematizing theories.

I am confident that men of science will achieve great strides in this respect during the current century. A theory of meaning should be rigorous, formal and explicit, but not to the exclusion of the varieties of empirical evidence that is currently largely unexploited in formal semantics. Concerning Esperanto, after more than a century of existence it is high time for a rigorous account in a specific linguistic theory (as opposed to ad-hoc descriptive grammars), *pace* Miner's (2010) pessimism in this regard.

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¹⁴Although Esperanto is the only significant case, a host of other constructed languages have been spoken at one point or another

¹⁵but probably not careers

 16 Please excuse the pompous physics envy – physicists and journalists alike seem to have no qualms about their hubris when they employ such slogans. This decade we will find the "God particle!"

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