
Reply to Christian Fermüller’s Comments on *Vagueness in Language: The Case Against Fuzzy Logic Revisited*

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Two of the linguistic papers in this volume—the one by Galit Sassoon and my own—though outwardly critical, seek a dialog with fuzzy logic. Thankfully, Chris Fermüller has taken up the dialog and the discussion has already been fertile—more on this later. Mainly though, this note is about the nature of idealization in linguistic research in general and in the specific case of *and*.

Idealization is a necessity in linguistic research. Verifiable theories in all empirical sciences rest on idealizations: point masses, perfect vacuums in physics, complete purity or homogenous mixture in chemistry, homogenous populations of species in biology. If anything, linguistics must rely even more so on idealization since linguistic data are extremely rich: the ways in any individual can relate to even a short sequence of words (or even made up word-like sound sequences) go far beyond acceptance and are affected by a multitude of factors. The *systematic description of observable linguistic behavior*, therefore, only plays only a supporting role in linguistic research as Fermüller also hints. Linguists idealize at various levels depending on their theoretical goals. In many cases, indeed, a successful research strategy has been to maximize idealization as much as possible up to almost loosing any relation to empirical observation (e.g. the minimalist program in syntax of Chomsky [2]).

The drive for idealization perhaps explains the linguists’ attraction to the classical semantics of *and* even more so than the argument of Kamp I review. Two relevant layers of idealization for the semantics of *and* are the distinction between competence and performance and that between semantics and pragmatics. The competence/performance distinction involves many factors, but for example whether we ask for a rash judgment or a more considered one. The semantics/pragmatics distinction assumes a separation between a bare, rather abstract sentence meaning perhaps just consisting of truth conditions and principles of sentence use that apply to the sentence meaning in a conversation scenario. Pragmatics is where most linguists would suspect the reason for the high acceptability of some sentences of the form $\phi \wedge \neg\phi$ lies while performance factors contribute additional noise. This presumption explains why there has been limited linguistic interest in such phenomena. Because of the nature of empirical research, data can only be evaluated against an interdependent network of theories that are, in the case of linguistics, at best partially understood. Assuming classical *and* as the semantics is attractive because it makes it easier to figure out some of the other components of the theory.

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The special role of classical *and* in cognition further motivates its status as the ideal for linguistic theory to adhere to. Fermüller mentions that at the meta-level even fuzzy logicians assume a classical (bivalent) semantics. I find it plausible that classical *and* is a conceptual universal in a broader sense like a platonic ideal though I am ignorant of relevant research on the matter. I suspect though that all of us, even a person fully ignorant of mathematics, will find it easy to adopt the concepts of bivalent propositional calculus including the meaning of *and*. Fuzzy logics with its variety of conjunction operators (of course, all converging on the classical *and* in a bivalent system) don't share this status. It's even worse that the system with $a \wedge b = \min(a, b)$ and $\neg a = 1 - a$ that is of attractive simplicity to linguists (e.g. the one Kamp discusses) doesn't have the properties mathematicians desire most.

How would we know idealization has been taken to far? I should mention that some linguists (though not me) have even tried to subsume constituent coordination as in *John and Mary are married* under classical logical meaning of *and* [5]. I think the Khmer facts Fermüller mentions make it difficult to maintain this view: A recently published grammar of Khmer describes it as follows: "The par excellence use of *nwng* is to signal constituent coordination, while that of *haeuj* is to signal clause coordination." [3, p. 407]. Also Japanese and another 124 languages [4] have two distinct words for constituent and clause coordination like Khmer. But even such evidence isn't unequivocal and one needs to more carefully consider the Khmer data.

In recent work of mine and others [1], we actually advocate a theory that assumes that intermediate truth values are part the semantics of natural language. For conjunction, we propose a new semantics that is not truth-functional with respect to the extensions (i.e. the truth values), but applies to the intensions of its conjuncts. So, this is fuzzy logic with a slight modification. We think this enables us to account a little better for speakers' intuitions concerning examples of the $\phi \wedge \neg\phi$ type including those discussed in my main paper in this volume. Our work, in my own opinion, moves dangerously far away from the ideal of classical *and*. The example of fuzzy logic has given us the courage to propose this system, but the jury is still out whether the gain is worth adding anything to the classical system.

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