What's in a planet?*

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Abstract

This Festschrift piece is the occasion to put forth some reflections on lexical meaning and on the internalism-externalism debate. I discuss, based on some of Frank Veltman's considerations about the pragmatic meaning of vague terms, the dynamic view whereby speaker and hearer jointly elaborate the meaning of general terms in the course of their transactions, and the question of whether general terms have a core meaning.

1 What's in three names?

I cannot think of celebrating Jeroen Groenendijk, Martin Stokhof and Frank Veltman without thereby celebrating the community to which their names are attached. I am sure all three of them will understand what I mean, but let me explain. Back in 2001, during the first year of my PhD in Paris, I went to my first ESSLLI summer school in Helsinki, encouraged by Philippe Schlenker whom I had met just a year before. In Helsinki Philippe introduced me to Paul Dekker, who asked me about my interests, gave me invaluable encouragements, and sent me by surface mail, just a few weeks later, two hard copies of two dissertations, one by Maria Aloni on the semantics of belief reports, the other by Jelle Gerbrandy on epistemic logic (the mysterious title of which: "Bisimulations on Planet Kripke", bears a rather serendipitous connection to the question I am asking in this paper). For me this was the beginning of a wonderfully fruitful intellectual and human relation with the Amsterdam community and the ILLC people.

I gave one of my first PhD presentations at the ILLC in 2002, a few months later, at one of the Logic Teas, invited by Boudewijn de Bruijn and Balter ten Cate, where I also met Robert van Rooij for the first time, and where Dick de Jongh kindly gave me an offprint of one of his papers on provability logic after my talk. The following summer I went to the first NASSLLI summer school at Stanford, encouraged by Paul Dekker and Patrick Blackburn. This is where I met Frank Veltman, who gave a memorable course on conditionals, and Johan van Benthem, who was hosting the event. (Although this Festschift is not the place to celebrate Johan, Johan was later to play an equally important part in the development of one direction of my PhD). Only a few years later did I first shake hands with Jeroen Groenendijk and Martin Stokhof: if I remember correctly, this was back in 2005, when I also met Maria Aloni, and was kindly hosted by Henk Zeevat for the first Paris-Amsterdam Logic Meeting of Young Researchers. But their work on questions had already guided me during all of my PhD years (along with Maria's thesis). Back in 2002, Balder ten Cate and I were sharing the same interest for their work on questions, although prompted by different problems. My own interest was in their work on embedded

*This paper is a Festschrit piece written in honor of Jeroen Groenendijk, Martin Stokhof and Frank Veltman on the occasion of their upcoming retirement. On the topic of planets, I am indebted to the organizers of the Elbereth 2013 conference held at the Institut d'Astrophysique de Paris for the invitation made to a philosopher to speak about vagueness to an audience of astrophysicists. Thanks in particular to Mathieu Languer, Agnès Ferté and to the audience for prompting me to think about the scientific and unscientific uses of the word "planet" in relation to vagueness.

questions, and on the features that could explain why some verbs are question-selecting and others not.

Twelve years later, I marvel at how much my work owes to these many figures. I can't think of any of the research projects that have mattered to me the most, not to mention the exciting collaborations I have had with Maria Aloni and Robert van Rooij, without thinking of the extraordinary inspiration received from the ILLC as a community. Like several Parisian friends of my generation (including Isidora Stojanovic, Benjamin Spector, Denis Bonnay, Mikael Cozic, Emmanuel Chemla), all with interests at the intersection of logic, language and philosophy, I think with gratefulness that we were a lucky group of French students, at the beginning of the 21st century, to be associated to the vibrant environment of the ILLC, and to be able to walk in the steps of some of its leading figures, like Frank, Jeroen or Martin. But let me save more souvenirs for another occasion, and turn to my main tribute.

2 What's in a general term?

This piece is about the vexed question of what determines the meaning of a general term in language, and about the dynamics of lexical meaning. By a general term, I mean a nonlogical expression whose extension is not reduced to a singleton (it includes adjectives like "blue" or "prime", nouns like "planet" or "number", verbs like "boil" or "divide"). I was prompted to write this paper after reading (an approximation to) Frank Veltman's address on the difference between vagueness and imprecision ("Het verschil tussen *vaag* en *niet precies*"),[1] and based on an interest for the relation between the scientific and the unscientific use of general terms.

An overarching theme of the work of Groenendijk, Stokhof and Veltman is the idea, shared with other theorists of language such as Stalnaker, Lewis, Heim and Kamp, that meaning is not statically encoded in the truth-conditions of an expression, but lies in the difference the use of that expression makes to the context. In his address, Veltman summarizes the idea as follows:

> *De betekenis van een zin wordt in zo'n opzet niet geidentificeerd met zijn waarheidscondities, maar met het effect dat die zin heeft op de cognitieve toestand van degenen die de informatie die in die zin vervat is moeten verwerken.*
>
> "In this approach, the meaning of a sentence is not identified with its truth-conditions, but rather with the effect that the sentence has on the cognitive state of those who have to process the information that is embodied by the sentence."

On the picture Veltman proposes, this view of meaning is meant to apply not only to full sentences, but to smaller units, namely words such as common nouns, adjectives and verbs. Their meaning is not rigidly fixed ahead of discourse, but it is negotiated between speakers of a community during their verbal transactions. Prima facie, this may seem to convey a rather internalist picture of lexical meaning, because the primary meaning attached to a word might then appear to be either what the hearer mentally represents, or more likely, what the speaker intends the hearer to represent. But of course, the lesson of this pragmatic approach can't be so simple, since on the one hand, speaker and hearer have to coordinate their internal meanings with each other for communication to be successful, and on the other hand, because the use of a word by a speaker is also based on properties of his or her external environment that the speaker is intending to refer to.

[1] Not being competent to read Dutch, I had access to that paper first by testimonies, and then with the help of Google Translate, which gave me a valuable but still rough approximation to a proper translation. I thank Floris Roelofsen for sending me the proper English translation of the citation which follows.

A particularly acute form of this tension between internalism and externalism about lexical meaning is indeed revealed when considering the meaning of *vague* general terms (like "blue", "tiger", "chair" or "planet"), which are the focus of Veltman's paper. On one end of the spectrum, we find externalist pictures of lexical meaning, including for vague expressions, according to which general terms, whether for natural kinds of artifacts, essentially track properties in the world (See Putnam 1975 for the general view, and Williamson 1992 on vagueness specifically).[2] On Williamson's version of the view, vague expressions, like precise ones, must have sharp underlying lines, because they purport to designate such external properties, which themselves must have precise contours. At another end of the spectrum, we find internalist pictures of vague meanings, on which speakers need only have "close enough" lexical representations in their head in order to successfully communicate (see Parikh 1994). Veltman's view of lexical meaning is obviously more in sympathy with the second picture, and this is also where my sympathy lies. I would like to question that second view, however, to see what amount of externalist residue it is likely to leave behind.

One of the examples Parikh discusses is that of color words, for which speakers of a community may have very different inner representations. What Parikh concedes, however, is the requirement of overlap. If my use of "blue" and your use of "blue" really have no extensional overlap, then we are likely to end in miscommunication. So let us consider two speakers who use "blue" with some overlap. Should we say that the overlap between your representation and my representation is where the objective meaning of the expression lies? It is tempting to think so, if we think of the overlap as consisting of a common set of referential values (prototypical values such as good or true blues). But that may still remain an idealized view of meaning, on which speakers all share something like the "semantic core" of an expression. What if you and I have learnt the meaning of "blue" by association to distinct exemplars (you saw only dark blues, and I only light blues)? What if my perception of colors is severely limited and yours isn't?

Maybe, to borrow a structuralist view of meaning, what really matters then is that your inner representation of "blue" be related to your inner representation of other color words in a way that is itself close enough to the relation between my representation of "blue" and my representation of other color words. On that view, your use of "blue" may have no extensional overlap with mine, but it might still be functionally congruent with my use of "blue". Maybe, but even so the structuralist view would fail to explain something. When we communicate, we do not just project mental representations, we refer to objects and events, and those acts of reference allow us to check our background representations against a foreground of contextually shared representations. After some episodes of communication, for example, you and I may realize that there is no extensional overlap between our uses of "blue", but that your spectrum and mine, for example, are shifted in systematic ways. For example, when you say: "give me the blue book" by pointing to that object that we both can see, I can adapt to what I take to be your inner representation of "blue", and think: "all right, for him that color counts as blue".

What would happen if a dialect were to start with terms to which speakers give extensionally disjoint interpretations? I think that plausibly, cooperative speakers, over the course of their transactions, would gradually come to extend and then adjust the initial extension they were individually giving to a term in order to factor in the distinct extension the term is likely to receive in the other's idiolect. If, having been raised to attach "blue" to disjoint sets of objects, you and I were to end up as Robinson Crusoe and Friday on a desert island, we would both be

[2]See Marconi (2013) for a recent discussion of the externalism-internalism debate in the case of artifactual words, but with more general lessons about lexical meaning, and more precise definitions than I can give here on what to include under the labels "internalism" and "externalism".

led to update our extensional interpretation of the word "blue", in a way that can resolve the previous lack of overlap between our respective meanings. In other words, the meaning of an expression cannot just consist in the speaker's individualized meaning prior to communication, it is dependent upon successive episodes of communication, whereby I learn that you would apply "blue" to this object, or deny it of that object. Consistently with the dynamic idea that meaning can be viewed as an update on the context, my update function for "blue" is dependent upon several parameters: upon my previous "blue"-to-objects associations, upon other people's observed associations, and then upon a host of tacit rules that we use to generalize the use of a category to unobserved cases.

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This leads fairly directly to think about those tacit rules. We build up and use lexical categories in order to assimilate new cases to old cases. The tacit rules we use for that have to be inductive methods by which we decide that a new case is or is not essentially similar to a previous case. In some cases, a category is extensionally infinite, but the rule we use for subsumption is entirely crisp. A good example is the case of "prime number". There are prime numbers yet to be discovered, and numbers about which it is still uncertain whether they are prime or not. But there is a crisp conventional definition of what counts as a prime number. It is prima facie different with a word like "blue". We are not given a definition of "blue" to begin with. Rather, we are given particular exemplars or cases to which we apply the term and hear it applied, and then we proceed by the application of inductive methods to new cases. Of course, the official definition of "prime" did not come before the observation that some numbers shared a property that others were lacking. A case for externalism can be made on that basis: maybe "blue" is like "prime", and we have simply failed to properly identify the general definition which would subsume all and only correct uses.

To illustrate this problem, I propose that we look in greater detail than philosophers have done so far at the recent debate that has concerned the scientific definition of the word "planet" among astronomers, on the occasion of the 2006 Meeting of the International Astronomical Union. In 2006, the IAU passed a resolution (resolution B6) whereby Pluto was demoted of the scientific category of "planet", and was ranked in a newly created category of "dwarf planet" (based on the convention, made explicit in the previous resolution B5, that a "dwarf planet" is not a "planet" in the strict sense). This lexical resolution has been and remains a subject of controversy and disagreement among astronomers. Prima facie, this controversy may seem just a verbal dispute. Chalmers (2011:542), for example, writes:

> "The manifestly verbal dispute among astronomers about whether Pluto is a planet is best understood as a debate in the ethics of terminology: given the scientific and cultural roles that 'planet' plays, should 'planet' be used to include Pluto or exclude it?"

Upon closer examination, however, the controversy about the definition of what counts as a planet reveals more. The reason the IAU even bothered to vote those resolutions in 2006 was based on the recent discovery of a new celestial body, with characteristics of size, mass and distance to the Sun relevantly similar to those of Pluto.[3] Initially, the question was whether that celestial body (initially referred to as 2003 UB313, also nicknamed Xena by its discoverer,

[3]The distance to the Sun is even greater, but Pluto was already the most distant of the nine planets.

and later officially called Eris by the IAU), was to be called a planet.[4] So the debate about Pluto actually was triggered by a problem of subsumption of a new case (along with a few others) under a preexisting category.

Mike Brown, one of the co-discoverers of Xena, has given a vivid illustration of the tension he initially felt about this question in his book *How I killed Pluto*. What we discover is that he first felt torn about that question, in a way that cannot be assimilated to a verbal dispute with himself (in the sense intended by Chalmers).[5] Amusingly enough, Brown reports that faced with his quandary, he first turned to "an old College friend with a PhD in philosophy", and asked him: "what does a word mean when you say it?" (2010:182). His friend's answer, much like the Humpty Dumpty response, was:

> "Words mean what people think they mean (...) so when you say "planet", it means what you are thinking when you say it".

Brown, however, reports lack of satisfaction with this rather crude version of internalism about meaning. Because of that, Brown went on a second wave of inquiry about meaning, this time to ask about the lay person's meaning:

> "So what do people mean when the say the word *planet*? That spring, well before anyone knew that the world was about to be handed a tenth planet, I started asking everyone I saw. The answers were diverse, and more often that not, scientifically misguided: large rocky bodies in the solar system (well not, there are gas giants), things with moons (not Mercury or Venus!), things that are big enough to see with your eye (Uranus, Neptune and Pluto are out), things that pull the earth around in its orbit (that's just the Sun). But when I then asked people to name the planets, everyone had exactly the same answer, starting with Mercury and ending with Pluto. (...) So again, I ask: what do people mean when the say the word planet? They mean a slew of unscientific clutter. And then they mean nine scientific objects in the solar system."

What Brown's informal survey reveals is a clear and unsurprising mismatch between people's ease at producing particular instances of the word "planet", and their reflective difficulty at extracting the general rule underlying their own use of the word "planet". But Brown did not stop there, he went on to ask about people's grasp of their lexical projection rules:

> "I always pressed people further. How would you know if something new was a planet? The answer was always the same. If it was as big as the other planets. Or, as I interpreted it according to my unscientific springtime poll, everything the size of Pluto and larger that orbits around the sun is a planet. (...) I remained torn. If Pluto was a planet, why the many things just a little smaller than Pluto not considered planets?"

[4] As Brown explains in greater detail in his book, there were prior issues in the astronomical community regarding the status of Pluto. Importantly for the debate, the discovery of Eris was not isolated: several other large 'Trans-Neptunians' bodies, orbiting further away from the Sun than Neptune, were discovered at about the same time by Brown and his team, including those now known as Quaoar, Orcus and Sedna. The term "Trans-Neptunian Object" is introduced explicitly in resolution B6, which says: "Pluto is a "dwarf planet" by the above definition and is recognized as the prototype of a new category of Trans-Neptunian Objects".

[5] See Chalmers 2011: "A dispute between two parties is verbal when the two parties agree on the relevant facts about a domain of concern, and just disagree about the language used to describe that domain", and compare with Brown's own judgment on the debate (2010: 232): "the debate about whether or not Pluto is a planet is critical to our understanding of the solar system. It is not semantics. It is fundamental classification." By "semantics", I take it, Brown means "terminological".

Interestingly, two distinct rules of generalization emerge from Brown's further questioning. The first is that a category like "planet" should be closed upwards with respect to size. This is commonly described as a principle of *monotonicity* in the literature on vagueness (viz. "if x is big, then anything bigger than x is big"). The second constraint corresponds to what is called the principle of *tolerance* (after Wright 1976, viz. "if x is big, then anything indiscriminably smaller than x is big").

As it turns out, the IAU chose to adjudicate the debate on the status of Pluto and Xena not by further questioning the principle of tolerance, nor by direct considerations pertaining to size, but by invoking a specific criterion, besides three accepted criteria all applicable to Pluto. The three uncontroversial criteria mentioned in the 2006 Resolution B5 are roughly: i) being sufficiently massive to be round in shape ii) orbiting around the Sun iii) not being a satellite [of something satisfying i) and ii)]. The additional decisive criterion invoked by the resolution B5 is for a celestial body "to have cleared the neighborhood around its orbit". This criterion is itself quite vague, but further reflections by Mike Brown (a supporter of the IAU resolution) tell something interesting about that criterion. In a blog post, Brown (2006) clarified the intent of the IAU resolution as follows:

> "The largest asteroid Ceres is not nearly massive enough to have accumulated all of the other asteroids, nor is it massive enough to shove the asteroids out of the solar system. It is not a dominant mass within the asteroid belt. The exact same could be said of Pluto and 2003 UB313 (which are essentially the same size and both in the Kuiper belt along with millions of other bodies). Every one of the eight planets easily passes this test though. The eight planets were created from an accumulation of most of the material that remained in their vicinity. They are the dominant bodies in their regions of space. (...) The important point to remember, however, is that the difference between the eight planets and everything else known in the solar system is so huge that even a definition with a lot of wiggle room will not make any difference. (...) The precise definition in the IAU resolution may be a tad unclear, but the concept is absolutely rock solid with absolutely no room for doubt about which objects do and do not belong."

In other words, according to Brown, the IAU's resolution incorporates a new dimension of comparison whereby 8 of the traditional 9 planets cluster together. This criterion has the effect of creating a sufficient gap between Pluto and the other planets, where mere considerations of size might have had the opposite soritical effect of including Xena and further celestial bodies under the extension of the word "planet" (on the virtue of gaps to solve vagueness, see also Rayo 2008, Pagin 2010).

4 The dynamics of lexical meaning

The discussion of the word "planet" was initiated by the question of whether a vague word like "blue" and a precise word like "prime" fundamentally have the same meaning properties, or whether they fundamentally differ. From Brown's discussion of the IAU resolution, some may be tempted to conclude that the vague word "planet" really is a word like "prime", and that the IAU resolution is one whereby a common set of features is meant to reveal an essence. But, in agreement with Veltman, I think it would be a very inadequate view of lexical meaning, and even of the lexical meaning of scientific terms. Rather, I think the debate about the scientific meaning of the word "planet" reveals four facts about the constitution and dynamics of lexical meaning more generally:

1) The first is that whether in the unscientific use of the term and in its scientific use, the decision to apply a vague category word to a new instance is based on the reliance by speakers on a stock of paradigmatic instances of the category (which may vary across speakers), and then on some inductive rules of similarity.[6] For example, judging by size alone, Xena would count as a planet to the extent that Pluto does; judging by the criterion of neighborhood clearance, neither Xena nor Pluto count as a planet. In both cases, a common principle is in play, which recommends treating similar cases in a similar way, but the respects of comparison are variable and open-ended (see Waismann 1945 on open texture). These open-ended respects, I take it, are part of what speakers select and negotiate over the course of their transactions (more on this below).

2) The second fact is that a scientific attempt to fix the meaning of a vague word like "planet" is mostly an attempt to differentiate and limit those respects of comparison in order to arrive at a coherent scheme of classification. Wherever there is vagueness, there usually is a plurality of coherent sharpenings for a vague expression, and no unique way to resolve that multiplicity into one meaning. Things are different with a precise predicate like "prime", because the term has been agreed to conventionally denote a single crisp property. Interestingly, even "prime" may be a case for which some indeterminacy could remain: for instance, why isn't the number 1 a prime number? Mathematicians have offered reasons to think of 1 as sufficiently dissimilar from other prime numbers, despite the fact that it is only divisible by 1 and by itself, but we might imagine that new mathematical facts might lead mathematicians to revise the standard definition of "prime" to again include 1.[7] If so, this would suggest that the meaning of "prime" itself remains subject to potential updates, based on a more global attempt at reaching a coherent classification scheme.

3) The third fact is that even in the scientific attempt at defining "planet", some vagueness remains in the definition, due to the open-endedness of the respects of comparison mentioned in 1), and due to the unexpected ways in which a new case can affect a preexisting ordering. If we follow Brown, the criterion may have the effect of temporarily ruling out actual borderline cases of the word "planet". But it will not rule out potential borderline cases, for which further quandaries and semantic indecision may arise (again, this is Waismann's notion of open texture, who characterizes the latter as "the possibility of vagueness"). Suppose, for instance, that other star systems are investigated, where celestial objects very similar in respects i), ii) and iii) to the 8 planets of the solar system have not cleared objects in their neighborhood: should we coin the definition of an "exoplanet" in a different way from that of a "planet", or revise the definition of a "planet"?

4) The fourth point is a concession to the Humpty Dumptyan view that on particular occasions of use, meanings are to a significant extent dependent on what speakers intend the expression to refer to. Some truth remains to that idea, but there is more in the dynamic view defended by Veltman, which is that the meaning of a vague term in conversation is usually compatible with a host of possibilities, even to the speaker. Those possibilities get to be cooperatively narrowed down as the dialogue proceeds. Suppose I tell my son: "draw a picture of Pluto for me", and he responds: "did you mean Pluto the dog, or Pluto the planet?". It would be ludicrous and pedantic to answer: "I did not mean the dog, nor could I have meant

[6] See Douven, Decock, Dietz and Egré 2013 for an elaboration of this idea in Gärdenfors' conceptual spaces framework. Note also the way in which resolution B6 explicitly stipulates Pluto to be the "prototype of a new category" in order to define the notion of Trans-Neptunian Object.

[7] See `http://mathforum.org/library/drmath/view/64874.html` on conflicting views about whether 1 was considered a prime number or not, and the historical references listed.

the planet, I meant the dwarf planet". In my son's question, the use of "planet" is playing a contrastive classificatory role, and there is no pressure to argue about whether the phrase "the planet" should mean anything more precise than "that celestial body", or "that thing above our heads".

In other contexts, the use of the word "planet" will be such that it cannot simply mean "celestial body". Brown himself, for example, is an advocate of the idea that, for the purpose of better explaining the formation the solar system, we should delimit the scientific understanding of the term "planet" (as restricted to the solar system) to an even narrower extension than what the IAU recommends. He writes (2010: 234):

> "In the class on the formation of planetary systems that I teach at Caltech, I try to convince my students that *really*, there are only *four* planets, and that Mercury, Venus, Earth, and Mars shouldn't count."

The sentence "*really*, there are only *four* planets" purports to revise the meaning of the word "planet" explicitly in this context. It means: "there are only four objects that ought to be called "planets"". That sentence is a direct proposal to fix the meaning of the term relative to a context, and an invitation made to hearers to update the context accordingly.

Compare this with a nonscientific context in which I utter: "it would be nice to live on a distant planet". What do I mean by "planet" when I say this? I think I can't possibly have a fully determinate idea myself (pace Humpty Dumpty). My hearer might carry on and say: "yes, I'd love to be able to live on the Moon sometimes". It would be uncooperative to retort: "oh, I did not mean a satellite, really I meant a planet". We can continue the conversation without having to worry whether I meant to include the Moon or not. Or my hearer could ask: "what do you mean? live on Jupiter?". This is an invitation to narrow down the possibilities. I may respond: "no, I meant: live on a place like Earth, but with fewer people on it". Depending on the dialogue, the possibilities compatible with my use of "planet" come to be specified and narrowed down in various ways. This leads back to the idea that unscientific uses of a general term like "planet" are based on implicit choices of salient reference points and of salient dimensions of comparison by the speaker and by the hearer. Those choices need not be fully articulated in advance. In agreement with the dynamic view of meaning discussed by Veltman, they will typically be coarticulated by the speaker and hearer over the course of the conversation. Most of the time, they'll never need nor get to be fully precisified.

5 Concluding remarks

So what is in a general term like "planet"? I think the first element of response should be, in agreement with the externalist conception: at bottom, particular objects that we first used the term to refer to, and to which our use and mental representations of a term were initially anchored. But that set of objects, depending on the term, can vary vastly between speakers. Moreover, it only provides each speaker with a finite inductive basis.

A second layer of meaning consists in the tacit rules of generalization which we have used to apply one and the same term to distinct objects, and which enable us to apply the term to new objects. I have barely touched upon such rules in this paper, but they obviously play an enormous role in our grasp and use of a general term.

A third layer of meaning comes from those new cases that we encounter and to which we decide to apply the term or not. Those are part and parcel of the dynamics of lexical meaning. What makes it so hard to pin down the meaning of a general term is that each new case, being

singular, brings along respects of comparison that are potentially unprecedented, but that remain relevant to look for further generalizations. This is the sense in which the discovery of the new celestial body Eris was relevant to the meaning of the word "planet" in the scientific context. The new criterion that the IAU selected to narrow the extension of the term "planet" is essentially one respect of comparison that was made salient and judged relevant toward further classification purposes.

More generally, as our examples have suggested, there are many ways to resolve the vagueness of a word like "planet" depending on the context. In general, a particular tokening of a term will leave the intended extension of the term massively underdetermined, but this will be good enough if speaker and hearer can use it to restrict possibilities and achieve coordination.

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