Planets, pluralism, and conceptual lineage

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A B S T R A C T

Conceptual change can occur for a variety of reasons; some more scientifically significant than others. The 2006 definition of 'planet', which saw Pluto reclassified as a dwarf planet, is an example toward the more mundane end of the scale. I argue however that this case serves as a useful example of a related phenomenon, whereby what appears to be a single kind term conceals two or more distinct concepts with independent scientific utility. I examine the historical background to this case, as a template for developing additional evidence for pluralist approaches to conceptual disputes within science and elsewhere.

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1. Introduction

In Theory Change and the Indeterminacy of Reference, Hartry Field famously challenged the continuity of reference for scientific terms in the face of revolutionary theory change. His key example was the term 'mass' as referred to from within Newtonian physics and Einsteinian physics. Field's contention was that "many scientific terms are referentially indeterminate – there is no fact of the matter as to what they denote (if they are singular terms) or as to what their extension is (if they are general terms)" (Field, 1973).

In this paper, I propose an alternative approach to conceptual change in science which is compatible with Field's, but which would ground at least some indeterminacy of reference in a qualified form of ambiguity. My contention is that many scientific terms are ambiguous because of terminological and conceptual lineages where different disciplines or specialisations develop in parallel. What I am concerned with is not in-series, mismatched meanings across revolutionary theory change, but rather mismatch of reference as can develop gradually between different branches of the same broad endeavour. My case study involves the history behind the 2006 definition of planethood (and demotion of

Pluto from 'planet' status), and the difficulty amongst the Astronomical community in determining that term's reference.

The discussion will complement recent work on the nature of natural kinds. Indeed, the case of Pluto's demotion is a high profile example which has been used in recent work on natural kinds, such as (Bokulich, 2014) and (Magnus, 2012), who both contrast it against the more philosophically well-trodden examples. While I will discuss these views (with similar comparisons), the natural kinds debate is not my chief concern. I will outline what I take the implications to be for the debate, but my main conclusions will be compatible with a wide range of positions within that debate.

My position will be that the *lineages* of kind concepts matter when considering whether those concepts are best seen as unified or divided, useful or dispensable; and these lineages can be evidenced by changes in kind term usage within identifiable, historically extended areas of study. Many conceptual histories (including across scientific revolutions) track conceptual change linearly as unbranching chains[1]. Synchronic comparisons of allegedly pluralistic scientific concepts on the other hand (such as in the 'species' debate) can miss deep conceptual connections and

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[1] For an excellent example of a conceptual history with respect to electrons, see (Arabatzis, 2005). Similar conclusions are expressed in (Kitcher, 1995).

common origins. The aim here is to argue that evidence of conceptual fission provides an underappreciated, pro-tanto reason to take synchronic pluralism more seriously.

I will argue that this can help resist metaphysical kind-monism, but also resists Ereshefsky's eliminativist pluralism (Ereshefsky, 1998, 1992) and Dupré's promiscuous realism (Dupré, 1993). In this regard, I will be broadly in agreement with the approaches to scientific kinds argued for by (Magnus, 2012) and (Brigandt, 2009, 2003). However, while my sympathies are with these authors with respect practice-driven approaches to natural kinds, embracing specific metaphysical positions is not necessary for my own approach.

Rather, what I outline here is more of a philosophical heuristic which may be valuable in a narrow class of cases of apparent scientific pluralism, more or less independent of specific metaphysical commitments. There is a general form of analysis to be elaborated here which may help to explain how terminological disputes arise, and also explain why they can be so fiercely contested and resistant to resolution. In this sense at least, my intent is broadly in the spirit of (Hájek, 2014; 2016) and other work that fleshes out philosophical heuristics. I conclude that the identified analysis and approach may have utility for certain disputes and philosophical debates, in bolstering the case for 'no fact of the matter' positions.

2. Polysemy

Key here is polysemy, a form of ambiguity in which a single lexical form is capable of being deployed in different but closely related way. Like regular ambiguity, polysemy is different from semantic vagueness in that it is not a matter of deciding on the extension of something that 'tails off'. But neither is it just regular ambiguity. For example, the word 'man' is polysemous because it can be variously used to refer to humankind as a whole, to male humans, or to adult male humans. In contrast, the different meanings of the word 'bank' (a river bank, a financial institution) exhibit simple ambiguity – there is no significant conceptual similarity or extensional overlap between the two uses of that term.

Speaking figuratively, if the problem of vagueness is about precisifying semantic categories (such as 'bald') along single dimensions of incremental change (like the number of hairs on a head), and ambiguity is about deciding which of several orthogonal dimensions we might be talking about when using a term which could refer to any of them, then polysemy is ambiguity without strict orthogonality – distinguishing between senses which are conceptually related and extensions which might partially overlap[2].

For linguists, there are many species of polysemy with different features and associated problems (see for example (Blank, 2003)). For my purposes though there are three simple features of interest:

1. Polysemy is the result of symbolic vocabulary being outstripped by imaginative capacity (there are fewer words than there are concepts),
2. Polysemy tends to arise in an uncoordinated way, when a new linguistic usage arises without the extinction of the old usage, or when two specialised usages diverge, and,
3. Polysemy is contextually sensitive, i.e. the concept which the lexical item stands for is typically made clear by the context of utterance, frame of enquiry, or descriptive utility.

Polysemy becomes philosophically interesting when the different, polysemous senses of a term each arise to have heft and weight as part of larger conceptual modes, models, or systems. Consider the following thought experiment:

Imagine you've been abducted by geographically inept time-travellers, who are keen to acquire Polish Vodka from a very specific era and have abducted you, a renowned expert on Poland, and taken you back to the year 1901 (assume this was a very good year for Polish Vodka). They are hovering their time machine over Europe asking you to identify Poland for them. In their eagerness however they haven't explained their motives; so all you know is that it's 1901, you're looking down on Europe, and they have asked you: "Where is Poland?".

Being an expert on all things Polish, you would know that Poland ceased to exist as an independent state in 1840, and will not be resurrected as a sovereign state until after World War One. So if your own interests were primarily in political history it might be obviously correct to tell them that their question is mistaken – as there is no such country as Poland in 1901. Alternatively, it also might be reasonable to indicate the lands contained within the pre-1840 Polish borders, or the inter-war borders, or the present day borders (they are all distinct, though partially overlapping) and use any of those as a basis for an answer. Or you might assume the Grand Duchy of Warsaw to be the 'true' Poland of 1901 (part of the Russian Empire).

But there are also entirely non-statist grounds on which to make a response; for example to indicate the area where the Polish language is spoken, or Polish culture the strongest (in 1901 that is). There seem to be a number of reasonable ways to frame a response, because without context the reference of 'Poland' is indeterminate.

This is the hallmark of a polysemous term. In this case there are many politically defined candidate referents with sharp boundaries, and many other more nebulous ones based on ethnicity, cultural practices and so-forth. Each of these is based on established practices or models which (by themselves) are perfectly reasonable, conceptually rich contexts within which the proper name 'Poland' might properly occur.

But in this thought experiment no suitable context had been set, so resorting to any answer straight off the bat would have been premature. From an entirely disinterested viewpoint, the best response would be a request for clarification: why is it *Poland* that they are asking for? Once you discover that their sole interest is locating Polish vodka, you have a better context for a precise answer. But in the absence of any precisifying context the referent is not straight-forward, even if you know everything there is to know about Poland – and misalignment of interests (you: politics, them: vodka) can naturally lead to talking past one another.

So this artificial case illustrates:

a) a significant failure of coincidence between polysemous extensions,
b) a lack of prior precisifying context, and
c) an understandable conflict of reference due to differing interests.

And the polysemy here also stems from a polysemous kind term with its own conceptual lineage: the kind term 'country'. Plausibly, the multiple senses of 'country' likely developed benignly, in parallel, as descriptive and explanatory needs become more sophisticated over time. For example, prior to the rise of the Westphalian system of modern nation states, there was arguably less polysemy around 'country', because state power cleaved more closely to dynasties and empires than to ethno-linguistic nations. It was developments in politics and international law over the last few hundred years which produced the situation where 'Poland',

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[2] Cheerfully enough, the boundary between polysemous and non-polysemous cases of ambiguity is vague.