Signs and Meanings: The Five Questions

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1. Why were you initially drawn to the theory of signs and meaning?

My dissertation, completed in 1976, is entitled: *The Ontology of Reference. Studies in Logic and Formal Ontology*. It is a study of theories of meaning and reference in Frege, Husserl and Michael Dummett. I had earlier attended many classes given by Dummett, during my time (1970-73) as an undergraduate in Oxford. I had been tremendously impressed by Dummett's passion for philosophy; but also dissatisfied with the sorts of answers to philosophical questions which he (channeling Frege) was proposing. I thus became interested in exploring alternatives to Frege-inspired approaches to philosophy, which seemed to me to rest on an oversimplified repertoire of ontological categories.[1] I very quickly became convinced that Husserl, and especially the sort of ontological thinking set forth by Husserl in the *Logical Investigations*, provided the key to what I was looking for. The *Ontology of Reference* embodies my early attempts to solidify this conviction, using Dummett and Frege as foils.[2]

I spent the next 20 years or so exploring the thought of Husserl, of his teacher Brentano, and of his great students Roman Ingarden and Adolf Reinach, with almost exclusive attention to themes in ontology (including the ontology of works of art, and of speech acts). I collaborated throughout this period with Kevin Mulligan and Peter Simons, with whom I still share many views on the nature of philosophy and on its current state.[3]

2. What do you consider your contribution to the field?

I have since been working primarily on applying ontology in a variety of extraphilosophical areas, above all biomedicine. In 2002, drawing on Husserl's coinage of the term 'formal ontology' and on a generous award by the Alexander von Humboldt Foundation, I established in

Germany the Institute for Formal Ontology and Medical Information Science.[4] I have since then been in the peculiar position of having witnessed how what had initially seemed a private concern of Mulligan, Simons and myself, namely *applied ontology* – (roughly) the application to real-world problems of ontological tools and theories deriving from philosophy – has burgeoned into a veritable industry, in which philosophical work overlaps with computer science, database engineering, and scientific research. Representatives of all of these disciplines are attempting to solve the problem of how, in an era of information-based science, it might be possible to make different sorts of scientific information work well together even though it is collected at different times and places, by different researchers using different vocabularies.

There are theoretical (logical, computational, linguistic, but also philosophical) problems to be addressed here; but also, perhaps most importantly, there are non-trivial socio-cultural problems of coordination, in the addressing of which I have also become heavily involved.[5] In addressing these multiple sets of problems each disciplinary community has, it seems, contributed its own confusions. I believe that my main contribution is (1) to have persuaded at least some of those working in the field that some of the repeating elements in these confusions are philosophical in nature; and (2) to have demonstrated that resolving these confusions in part by using recognizably philosophical methods and theories, may bring positive practical benefits.[6]

One interesting feature here is that some of the most influential ways people go wrong – for example in the use of circular definitions – are resolved already in beginning courses in logic. Another significant contribution, therefore, has been a series of attempts on my part to convey to working biologists some of the lessons of introductory logic. The paper on the logic of relations[7] which grew out of this work has been downloaded some 25,000 times, and it has been cited in over 200 other papers published in biology and biomedical informatics journals. The Gene Ontology, thus far the world's most successful ontology, has been especially influenced by my efforts on this front, in ways which its developers see as bringing genuine benefits to its users.

3. What is the proper role of a theory of signs and meaning in relation to other academic disciplines?

One important contribution which those working on meanings and signs might make for the future is to clarify the thinking of those – a multidisciplinary community predestined to play an

increasingly influential role in our lives – who are engaged in what is various called 'information modeling', 'conceptual representation', 'knowledge modeling' and so forth.

Here what we might call the UM axiom (for 'Use-Mention Confusion') is especially important:

> **UM:** Terms (and other units of representation, for example in computers) should be distinguished strictly from the objects they represent in reality.[8]

All those involved in addressing the increasingly urgent need for theoretically well-founded methods and resources to manage the burgeoning wealth of information brought by the use of computers in science should be thoroughly apprised of this axiom at least several times a day. They should be reminded, for example, that an entity in reality is not identical to a website describing this entity, and that neither are identical to the website's URL.

4. and 5. What do you consider the most important topics and/or contributions in the theory of meaning and signs? What are the most important open problems in this field and what are the prospects for progress?

As someone trained as a philosopher ontologist, I was at first completely at sea in my attempts to understand the odd statements made by many of those developing or using ontology-like artifacts in the information technology field. I have become especially involved in trying to understand how ontologies are being used in healthcare information technology, for example in fostering a more coherent treatment of patient data in electronic health records.[9,10] The more I looked into the way such data is treated at the moment, the more I was confronted with the (to me obvious) confusions in the theory of signs, meanings and objects referred to already above.[11]

Notorious examples of such confusions are to be found in the relevant ISO (International Organization for Standardization) standards in health informatics, where the ideas of a certain Eugen Wüster, a Viennese semiotician/philosopher/terminologist/businessman and professor of woodworking machinery, have been extraordinarily influential.[12] From Wüster's point of view, through the sensations with which we are bombarded in the initial stages of our life, we begin to acquire what Wüster calls "concepts". Before we can assign a term to such a concept, Wüster says, we must first "delineate" the concept by listing 'the totality of "characteristics" which form

the concept's content or intension.' Sometimes, Wüster suggests that such characteristics are themselves just further concepts (so that, like other concepts, they would exist in the heads of people). At other times he suggests that they are properties of objects existing in the world. But when faced with the problem of defining clearly whether characteristics refer to concepts in the head or to properties of objects in the world, the response of Wüster and his epigones is to assert, in effect, that *there is no difference between the two*. This is in keeping with a general failure to discriminate clearly between objects and concepts which runs through terminology work that has been influenced by Wüster's thinking (counterparts of which I find also in some other types of semiotic thinking, in some work in cognitive linguistics, and in almost all work on so-called 'conceptual modeling').

The influence of this failure is illustrated most clearly, and perhaps most tragically, in the work of HL7 (for "Health Level 7"), a large and influential body, comprising representatives of different parts of the health care information technology industry in some 66 countries. HL7's pride and joy is its 'Reference Information Model' (or RIM), an artifact which has, strangely, been elevated to the status of an ISO standard. Central to the RIM is the concept 'Act', which is defined as meaning:

> A record of something that is being done, has been done, can be done, or is intended or requested to be done.

An Act, then, is something like: the record of an act. The term 'Act', for the RIM, embraces: assessments of health conditions (such as problems and diagnoses), healthcare goals, and observations. An *observation* is defined, in its turn, as:

> An Act of recognizing and noting information about the subject, and whose immediate and primary outcome (post-condition) is new data about a subject.

As is I hope already clear, the HL7 documentation conveys a certain uncertainty as to whether an *Act* should most properly be conceived as a *record* of something that is being done, etc., or as *the act of doing that is recorded*. Both views are represented prominently in different places in the RIM documentation, and efforts have been made in various circles to resolve the contradiction between the two. The HL7 organization, one might think, would by now, after more than 10 years of RIM development, have resolved this contradiction through some official *diktat*

as to which of these two evidently conflicting interpretations is correct. Incredibly, however, they resolve the issue with the following declaration (English and punctuation as in the original):

> Act as statements or speech-acts are the only representation of real world facts or processes in the HL7 RIM. The truth about the real world is constructed through a combination (and arbitration) of such attributed statements only, and there is no class in the RIM whose objects represent "objective state of affairs" or "real processes" independent from attributed statements. As such, *there is no distinction between an activity and its documentation.*[13]

The solution to the logical contradiction between 'An Act is a record' and 'An Act is an action in the world' is to deny that these two statements are in logical conflict – because an activity and the record of an activity *are one and the same.*[14]

In the specific field of biomedical informatics, and biomedical ontologies, there are some signs of progress. Some ontology developers, for example, are beginning to learn that when they use a word like 'kidney' in an ontology, then this word should not be interpreted as referring to some representation in a computer, or to some concept in someone's head, but rather to an entity on the side of reality. This leads to another central axiom for ontology developers, which we might call TC, or: the axiom of terminological coherence:

> **TC:** For any expression 'E' in an ontology, 'E' means E.

I am sometimes asked what might be the pragmatic consequences of ontology developers getting this thing right or wrong. The answer to this challenge can again most easily be illustrated by the case of HL7. First, the consequences of multiple, cascading violations of UM and TC are that the documentation guiding successive cohorts of users of HL7 artifacts is (as the HL7 organization has recently been forced to admit[15]) often painfully unintelligible. HL7 initiates themselves have thereby become involved in interminable disputes, documented for all to see in HL7's public email fora. Another is that multi-million-dollar projects fail,[16] leading, I believe, to the entrenchment of what thereby begins to appear to be a well-justified pessimism as to the very viability of information technology in the domain of healthcare.

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[1] Barry Smith, "Against Fantology", in Johann C. Marek and Maria E. Reicher (eds.), *Experience and Analysis*, Vienna: HPT&ÖBV, 2005, 153–170.

[2] It was never published, but you can find it, along with my other papers on Husserl, here: http://ontology.buffalo.edu/smith/articles/husserl.html.

[3] See Kevin Mulligan, Peter Simons and Barry Smith, "What's Wrong with Contemporary Philosophy?", *Topoi*, 25 (1-2), 2006, 63-67.

[4] http://ifomis.org/.

[5] http://obofoundry.org/; http://bioontology.org/.

[6] Barry Smith, Michael Ashburner, Cornelius Rosse, Jonathan Bard, William Bug, Werner Ceusters, Louis J. Goldberg,   Karen Eilbeck, Amelia Ireland, Christopher J Mungall, The OBI Consortium, Neocles Leontis, Philippe Rocca-Serra, Alan Ruttenberg, Susanna-Assunta Sansone, Richard H Scheuermann, Nigam Shah, Patricia L. Whetzel, Suzanna Lewis, "The OBO Foundry: Coordinated Evolution of Ontologies to Support Biomedical Data Integration", *Nature Biotechnology*, 25 (11), November 2007, 1251 -1255.

[7] Barry Smith, Werner Ceusters, Bert Klagges, Jacob Köhler, Anand Kumar, Jane Lomax, Chris Mungall, Fabian Neuhaus, Alan Rector and Cornelius Rosse, "Relations in Biomedical Ontologies", *Genome Biology* (2005), 6 (5), R46.

[8] Barry Smith, Waclaw Kusnierczyk, Daniel Schober, Werner Ceusters, "Towards a Reference Terminology for Ontology Research and Development in the Biomedical Domain", O. Bodenreider, ed., *Proceedings of KR-MED*, 2006, 57-66. Also available online at: http://ceur-ws.org/Vol-222

[9] The same confusions are present elsewhere; for example in the oil and gas industry. See Barry Smith, "Against Idiosyncrasy in Ontology Development", in B. Bennett and C. Fellbaum (Eds.), *Formal Ontology in Information Systems* (FOIS 2006), Amsterdam: IOS Press, 2006, 15-26.

[10] I became intrigued also by questions pertaining to the nature of records more generally, for example in the sphere of economics and commerce. See Barry Smith, "Searle and De Soto: The New Ontology of the Social World", Barry Smith, David Mark and Isaac Ehrlich, *The Mystery of Capital and the Construction of Social Reality*, Chicago: Open Court, 2008, 35-51.

[11] Barry Smith, "Beyond Concepts, or: Ontology as Reality Representation", Achille Varzi and Laure Vieu (eds.), *Formal Ontology and Information Systems. Proceedings of the Third International Conference (FOIS 2004)*, Amsterdam: IOS Press, 2004, 73–84.

[12] Barry Smith, Werner Ceusters and Rita Temmerman, "Wüsteria", *Medical Informatics Europe* (MIE 2005), Geneva, *Stud Health Technol Inform*. 2005;116:647–652.

[13] ANSI/HL7 V3 RIM, R1-2003: RIM Version V 02-11. Membership Normative Ballot Last Published: 11/22/2005 8:05 PM. Section 3.1.1, emphasis added.

[14] Barry Smith and Werner Ceusters, "HL7 RIM: An Incoherent Standard" (MIE 2006), *Studies in Health Technology and Informatics*, vol. 124, 133–138.

[15] http://hl7-watch.blogspot.com/2007/09/piece-of-good-news-has-been-posted-on.html.

[16] Examples of all of the mentioned phenomena are documented at http://hl7-watch.blogspot.com/.