Report

# Third Interdisciplinary Conference InterOntology10*

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The third Interdisciplinary Ontology Conference was held in Tokyo, Japan, from February 27 to February 28 2010. Organized by the Japanese Center for Ontological Research (JCOR) and cosponsored by the Japanese Government's Ministry of Education and Science (MEXT), the stated goal of this forum is to support the "exchange of ideas and state-of-the-art technologies for those working in the ontology domain from around the world". The event has a quite unique flavor, for it gathers researchers from disciplines as disparate as computer science, logic and philosophy, as well as a variety of application domains. The common thread is the discipline of ontology, which has undoubtedly gone a long way since its early days in ancient Greece.

We all know that ontology began as a branch of philosophy, studying the types of entities in reality and the relations between them. In the seventies, the early researchers in artificial intelligence borrowed the word from philosophy and applied it to their discipline. Consequently, if ontology used to be intended as a systematic account of Existence, within this new context, what "exists" has become that which can be represented using a computer. Disciplines such as ontology engineering were soon to be born, which investigated (among various other more technical aspects) how to best employ the rich body of theory from philosophical ontology to the purpose of making conceptual distinctions in a systematic and coherent manner. Nowadays ontology has become an established branch of computer science, which offers solutions to problem in areas as disparate as data integration, information retrieval, natural language processing, industrial planning and many others.

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As already mentioned, it is not uncommon for this conference's attendees to be almost unable to follow a talk, for it uses the word 'ontology' in a way never heard before. This is, on the contrary, one of the most interesting aspects of the strongly interdisciplinary meeting. In the review that follows we hope to give to the reader a small taste of this feeling, and a better appreciation of the many senses we can talk about ontology in 2010.

Achille Varzi's paper titled *On the Boundary Between Material and Formal Ontology* sets the scene for the whole conference. Material ontology, the one made popular by Quine, is concerned with the question of what there is, while formal ontology, often related to the work of Brentano and Husserl, focuses not on what there is but on the formal structure of what there is. So, for example, the former may include debates on whether abstract particulars exist or not, or arguments in favor of the existence of holes. Instead under the heading of the latter we might find issues such as whether an entity is self identical or not, or attempts to prove that no entity can consist of a single proper part. In general, the second type of ontology is concerned with the general features of what exists, independently of what that is. Thus, formal relations such as identity, parthood or dependence should be rightly investigated by formal ontology, and kept separated by the more specific problems of material ontology. This is the traditional view on the subject but, Varzi challenges us, is the boundary so clear? With a well-developed argument, the author argues that one cannot pursue one sort of theory without also engaging in the other. In other words, the "tasks of material ontology presuppose the backing of some formal-ontological theory", and that not always formal ontology can be "in the material sense of the word, ontologically neutral".

Antony Galton with the paper *How is a Collection Related to its Members?* gives us a first tasting of the depths of formal ontology by discussing the often neglected relationship of membership between an object and a collection too which it belongs. If a choir may be regarded as a collection of singers – not just an arbitrary collection of singers, but a group of singer that have formed an agreement to come together for the purpose of performing certain types of music – how shall we characterize the relationship between the choir and the singers? The obvious first answer can be that the singers are the choir; however a more rigorous ontological analysis would impose us to define what we mean by 'are' in the previous statement. If 'are' stands for an identity relation, then we would immediately have to face the problem of a singular thing being identical to a plural one. Galton takes us through two possible solutions to this

problem, which are considering a collection equal to the mathematical set of its members, or considering it equal to the mereological sum of its members, but in both cases he concludes that we have not gained any new ground. We must then admit that "the collection is *sui generis*, and cannot be identified with anything that we can specify independently". Consequently, a relation other than identity seems to be needed here. According to Galton, we can approach this issue by looking at an analogous ontological problem about which the relevant literature is much more abundant. In fact, the relationship between a collection and its members is analogous to the relationship between a material object and the matter it is made of, and the relation between an assembly and its components. Therefore a thorough consideration of the principal philosophical positions related to the latter problems (such as eliminativism, constitution and four-dimensionalism) will help us elucidate matters with respect to our initial issue. Furthermore, Galton points out a new possible alternative, which is based on distinguishing synchronic and diachronic forms of identity. This approach, he says, has often been discarded as impracticable or bizarre, but it is worthwhile exploring especially in relation to the formal characterization of collections.

The article of John Bateman, *Ontological Modularity: Unity in Diversity*, gives us a brief tour of the type of problems computational ontologists have to tackle. Bateman reports on the work of the Collaborative Research Center for Spatial Cognition, an interdisciplinary team sponsored by Bremen and Freiburg universities that investigates "the acquisition, organization, utilization and revision of knowledge about spatial environments, be it real or abstract, human or machine". The range of computational systems that benefit from this type of research is quite vast: for example, we can think of softwares for human-robot interaction, ambient assisted living or architecture and building specifications. One of the great issues in this area, says Bateman, comes from the need to provide explicit models that do justice to a rather diverse set of requirements. Such requirements, in general, can be grouped under three major headings. First, we have formal ontology, which has long been attempting to create a coherent formal characterization of the spatial properties of objects. Second, there is linguistic, which accounts for all the usage of spatial expressions in natural language. Third, we have qualitative spatial representation and reasoning, a research area in artificial intelligence that (broadly speaking) poses the accent on the creation of decidable spatial models of reality, that is, models that can be used productively by computers. In

his article, Bateman shows that too often all of these three approaches have been working in isolation, and that if confronted with each other they tend to choose reductionist solution, so that one might arrange the three approaches hierarchically and make one set of distinctions 'more basic' than other. In contrast with this reductionist view Bateman advocates a radical 'multiperspectivalism', a view that does not rule out the possible incompatible nature of different representations of space, but attempts to find the synergies among them. This can be achieved only if we use formal languages committed to notions of 'strong structuring', 'modularity' and 'heterogeneity'. In particular, he discusses the use of the Common Algebraic Specification Language (CASL), which embeds the principles above and therefore supports the creation of non-reductionist spatial ontologies.

Werner Ceusters and Barry Smith *Malaria Diagnosis and the Plasmodium Life Cycle: The BFO Perspective* is a good example of applied ontology in the biomedical domain. In their paper, the authors address the problem of producing a formal representation of the concepts of diagnosis, disease, symptom, disorder, pathological process and other biomedical notions. In particular, they look at the specific case of diagnosing malaria: this disease can be suspected on the basis of both symptoms reported by the patient and physical findings detected at examination; however, for a definitive diagnosis to be made, laboratory tests must demonstrate the presence within the patient of malaria parasites. To make the situation more difficult, some people are infected but not made ill by the parasites, thus requiring a further differentiation between the concept of malarial illness and that one of malarial infection. Ceusters and Smith show how their Basic Formal Ontology (BFO) can be used to put logical order among these concepts, so to create a coherent formal model which can support software applications in performing a number of knowledge-intensive tasks. Another example of biomedical ontology is given by Christopher Baker and colleagues, with a paper titled *Lipid Ontologies*. In this case the ontology addresses the problem that "lipid research lacks a consistent nomenclature for lipids" and that "different lipid research groups have developed customized classifications of lipids that are relevant only for a restricted category of lipids". The authors therefore present their contribution as a rigorous formal ontology aiming at covering the subject area in a systematic and explicit way, to the aim of facilitating the process of data integration between different users.

A more computer science perspective on ontologies has been given by Robert Meersman in his *Hybrid Ontologies in a Tri-Sortal Internet of Humans, Systems and Enterprises*. According to the author computational ontologies must be framed within an epochal change that includes the most recent technological advances in our society, such as the pervasiveness of computing devices, the participatory character of the web (the so-called Web2.0) and the total transformation of traditional business processes by means of the internet. Within such a scenario ontologies will achieve their intended purpose of facilitating the integration of information only if they get closer to the world and daily practices of human beings. In other words, they must become hybrid ontologies, where "concepts on the one hand are circumscribed linguistically and (mostly) declaratively by agreement within (human) communities, and on the other hand identified formally (and unambiguously) for use in computer-based information systems".

While all the articles presented so far have been given by invited speakers, a large portion of the conference consisted of contributed papers and research reports. We are going to name just a few of them, as they are indicative of the broad horizons the Interontology conference usually has. *Existence and Vagueness* by Elisa Paganini attacks Sider's claim that the word 'exist' is non-vague, even if intended as equivalent to an unrestricted existential quantifier. Claudio Calosi's *Three-Dimensionalism and Formal Theories of Location* composes and argument in favor of a four dimensional spatiotemporal ontology. In *DNA Sequences from Below: A Nominalist Approach*, Yu Lin throws the basis for a formalization of molecular biology that does not require the existence of abstract objects. In *Building up a Large Ontology from Wikipedia Japan with Infobox and Category Tree* Takahira Yamaguchi and Takeshi Morita discussed how they used computational methods to automatically extract an ontology from the community-constructed Japanese Wikipedia website. Finally, Makoto Sakai and Hiromichi Fukui have presented *Ontology Study for Analysis and Anatomy of English-language News Relating to Human Security*, discussing their use of ontologies to support disambiguation in a system that integrates online news articles.