Applied Ontology: A New Discipline is Born

The following appeared (in Italian) in the distinguished Italian newspaper *Il Sole-24 Ore* (said to be Italian equivalent of the Wall Street Journal)on Sunday May 24, 1998, as part of a full-page spread on the Department's Marvin Farber Conference held in April:

The discipline of applied ethics already has a certain familiarity in the Anglo-Saxon world, above all through the work of Peter Singer. Applied ethics uses the tools of moral philosophy to resolve practical problems of the sort which arise, for example, in the running of hospitals.

In the University at Buffalo (New York) there was organized on April 24-25 1998 the world's first conference on a new, sister discipline, the discipline of applied ontology. Applied ontologists seek to apply ontological tools to solving practical problems of the sort which arise in various extra-philosophical domains.

One source of applied ontology is work on expert systems in the artificial intelligence field. In constructing software tools for merging large databases, it has proved fruitful to develop common ontologies in terms of which divergent bodies of data derived from different sources can be unified together into a single system. Ontological engineering of this sort was pioneered by Tom Gruber and his colleagues on the Knowledge Interchange Project in Stanford. It is represented in Italy by Nicola Guarino and his co-workers at the CNR in Padua.

A second source of applied ontology is in the domain of legal analysis. As David Koepsell, [Ph.D. 1997], one of the organizers of the Buffalo conference points out: "Legal systems in general are composed of legal entities, such as laws, contracts, obligations, and rights. Their application yields new categories of entities such as: corporations, trademarks, marriages, and parcels of real estate. But the categorization of these entities by different legal systems has not, by-and-large, been conducted in ways which exploit the tools of modern ontology. Consequently, contra-

dictions and inconsistencies often arise in the law when, for instance, one type of entity is forced into two mutually exclusive categories (e.g., when software is considered to be both patentable and copyrightable)."

The growth in importance of ontology turns on the fact that, in an age of rapid technological progress, legislators, jurists and lawyers must grapple with constantly changing domains of objects. The expansion of trading blocks and treaty organizations, and the concomitant growth in importance of international law, have subjected the processes of law-making and enforcement to challenges of increasing intensity. Legal systems have been forced to try to fit such things as genetically engineered life forms, artificial intelligences, "virtual" currencies, DNA fingerprinting,

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and the Internet into legal schemes which, when initially developed, anticipated no such phenomena.

Legal schemes need to be continuously updated in light of technological and other innovations. Given the myriad forces at work in constraining legislation, revision has been carried out primarily in an ad hoc manner. The resultant legislation is in consequence marked by a general failure to examine or develop categorical schemes, or ontologies, of sufficient generality and robustness to comprehend both old and new varieties of objects. Examples abound of new types of objects with which the law has failed to come to grips in reasoned fashion. Do national boundaries exist on the Internet? Are genetically engineered

life forms *expressions*, which ought to be afforded the protection of intellectual property law? If so, are they expressions of the sort which may be patented, or are they expressions of the sort which may be copyrighted? The answers to such questions must reflect ethical, economic and other considerations. But the questions themselves are ontological: they are questions about how given entities are properly to be categorized, and the task of providing answers to such questions can be aided through the development of legal-ontological theories, theories of intellectual property law, of artefacts, and of biological entities. It is ontological questions which are at issue in the current dispute between Microsoft and the U.S. Justice Department over the question: *what is an operating system?*

The discipline of applied ontology is a new field, but it has already become recognized as an area of growing importance, and ontological methods have already successfully been applied in the medical and other domains. (See Andrew Frank, "Ontology: A Consumer's Point of View" in *Spatial and Temporal Reasoning*. Oliviero Stock (ed.), Dordrecht: Kluwer, 1998.)

Applied ontology has been used by governments, for example in the design and construction of new computerized systems of land registration in the post-communist countries of Eastern Europe. And it has entered also into the business world; the firm Ontek—short for 'ontological technology'—of Laguna Beach, California employs ontologists in the design of software systems to serve as 'white collar robots' in the running of repair shops for large aircraft maintenance. Such systems require ontologies embracing within a single framework not only aircraft parts and functions, but also the raw-materials and processes involved in repair, the times these processes and sub-processes take, job-shop space and equipment, an array of different types of personnel, as well as counterparts of the costs and other economic properties of all of these

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entities, including costs of transport, storage, and much much more.

The major part of the Buffalo conference was devoted to the ontology of social reality developed by John Searle in his book *The Construction of Social Reality*. On Searle's view social institutions arise when parts of physical reality are deemed, in certain contexts, to have special sorts of powers or to have a special sort of status. Thus this man counts in a certain context as *president*, and that man as *judge*. Searle's cognitive theory of social institutions was the object of talks in Buffalo by Raimo Tuomela (Helsinki, Finland), Ingvar Johansson (Umeå, Sweden), Anthonie Meijers (Tilburg, Netherlands) and Fernando Atria (Edinburgh, Scotland). **Mariam Thalos** (Buffalo, NY) presented an account of decision-making in the social world based on the idea that social institutions can serve to reduce the number of degrees of freedom facing social actors in their processes of decision-making. Dieter Münch (Berlin) and Randall Dipert (West Point) spoke on the onology of artifacts, and more specifically on the multidimensional ontologies needed to cope satisfactorily with large-scale technical systems of the sort which are involved in the provision of medical services to rural areas via computer. Clark Hare (Webwithe Publishing, California) spoke on the ontology of intellectual property, and **Leonardo Zaibert** (Caracas, Venezuela), [Ph.D. 1997], applied Searle's theory of institutional facts to the phenomena of real estate. Trevor Bench-Capon and Pepijn Visser (both of the institute of Legal Informatics at Liverpool)

spoke on the use of ontologies in the field of expert systems research, and on the idea of a virtual ontological library within which the ontologies developed for different purposes could be indexed and compared in systematic fashion. Lars Lundsten (Helsinki, Finland), finally, spoke on the ontology of television and of mass media in general, which he saw—in terms derived

resentation by a television production team of carefully manipulated images which are selected and broadcast for specific purposes. The proceedings of the conference are available on the web at http://wings.buffalo.edu/philosophy/farber, and they will be published in book form in due course.

submitted by **Barry Smith**

A full page on the Farber Conference "Applied Ontology" in the Italian newspaper Il Sole-24 Ore

from speech act theory—not in terms of the perception by the audience of a scene (for example of bombing in the Gulf War), but rather in terms of the rep-