

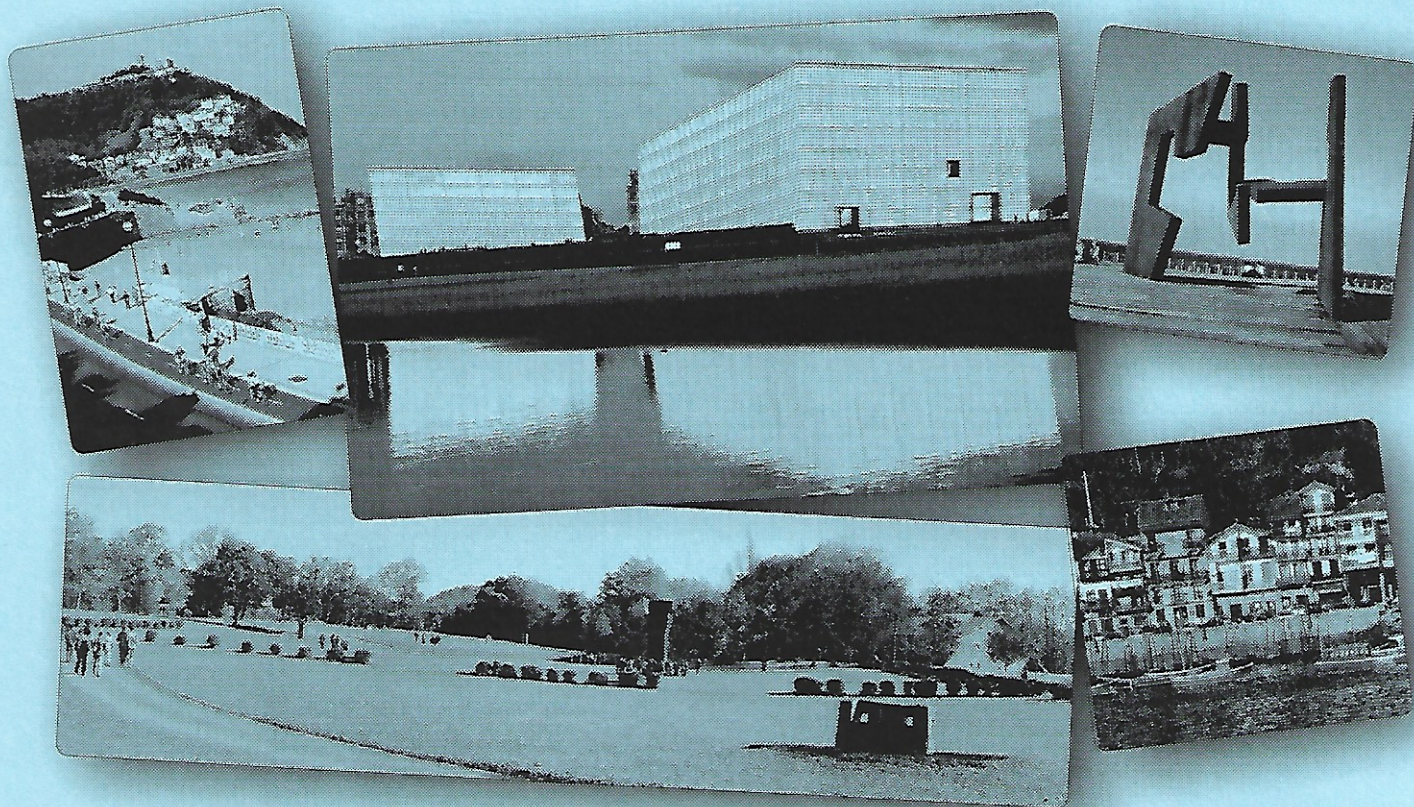
HPLMC-04

Third International Workshop on the
History and Philosophy of Logic,
Mathematics, and Computation

Donostia
San Sebastián

Spain,

4-6 November 2004



TOPICS

- (1) Philosophy of Mathematics in the 20th Century.
- (2) Category Theory: History, Philosophy, and Logic.
- (3) History and Philosophy of Epistemic Logic.
- (4) The Origins of Artificial Intelligence.

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Third International Workshop on the History and Philosophy of Logic, Mathematics, and Computation

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Categories and philosophy

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Categories and philosophy

Extended abstract

Abstract

Category theory can be a tool used in philosophical theories and itself has an ontological status. More, there is a kind of *categoricism*. To justify these propositions is the scope of this paper.

1 Introduction

There are, basically, three conceptions of category. One can use the concept in the same sense of Aristotle or Kant. Otherwise, there is also the mathematical sense which were first developed in the works of MacLane and Eilenberg. It is in the mathematical sense that I use the concept of a category. I argue that category theory can be used as a tool in order to formalize philosophical theories and concepts being therefore able to clarify its problems. The general assumption of this work is that logic can be applied in philosophy. Many examples of this fact can be found in the literature: Lewis' counterpart theory, Kripke's necessary *a posteriori* truths, knowledge's definition and a great variety of direct applications as in the case of logics with clear ontological status: modal logics for metaphysical modalities, epistemic logics for epistemological concepts such as knowledge and belief, para-consistent logics for inconsistent non-trivial theories and so on. The use of logic in philosophy seems to be well established. I also defend that categories have an ontological status in the sense that they are able to elucidate a general structure of the world.

2 Categories and logic

2.1 Logical operators

The first link between logic and categories appears already in the notion of logical operators. The special property of these operators is that they formalize philosophical concepts. Logical operators can be represented in categories using the notion of arrow (or morphism). Conjunction, disjunction, negation, implication have a particular categorical representation. There are already attempts trying to represent in categorical terms modalities as necessity. Concepts traditionally conceived as philosophical are alive in categorical reality: truth, falsity, contradiction, existence, object etc.

2.2 Combination of logics

The second link between logic and categories appears in the methods for combining logical systems. These methods are used to construct powerful logics able to formalize more complex propositions involving multiple philosophical notions. There are a lot of methods to combine logics: fusion, products, synchronization, fibring etc. These methods can be represented categorically by means of universal constructions in categories, given that logics are also understood as objects of categories. So, it is useful to use categories to elucidate how to combine logics and to help in the task of finding powerful logics to formalize philosophical concepts.

2.3 Philosophy of logic

A very famous and important category called *topos* has as internal logic not classical one, but the intuitionistic one. This means that the logic intern a category does not have an isomorphism with Boolean algebra. Instead, it is isomorphic to an Heyting algebra being then an intuitionistic logic. The categorical universe is not a classical one. Indeed, it is virtually possible to obtain different logics inside different notions of categories. Philosophical problems which arise from these researches are important in the philosophy of logic.

3 Categories and philosophy

3.1 Categories and ontology

The variety of ontological questions related to categories are so great that would be possible to re-construct systems of ontology from the categorical point of view. It is also possible to construct a criteria of existence using the concept of a category. For instance, suppose that there is an abstract category C composed by a set of objects and a set of arrows satisfying the relevant properties to be a category. A criteria of existence could be: something exists if and only if it is a member of C . A particular criteria of existence for mathematical objects would be: a mathematical object exists if and only if it belongs to a category. It is important to say that the mathematical conception of category is not so rich and, for this reason, it is not able to apply to unspecified collections of objects. Maybe we should enlarge our notion of category in order to formalize more concepts. Using a more fine conception of category would be possible to change Quine's ontological criteria by a new one: being is being element of a category.

3.2 Categoricism

I call categoricism the project according to:

1. It is possible to re-construct, formalize and clarify philosophical concepts and theories as well it is possible to solve philosophical problems using as tool category theory;
2. Categories have ontological status in the sense that categories reflect general and abstract properties of reality in general, not just mathematical reality;
3. It is possible to derive mathematical truths from categorical truths (expanding then logicism).

Categoricism is just a chapter of the hard attempt to use mathematical tools in philosophy.

4 Conclusion

There are a lot of things waiting to be done in categoricism. Indeed, the ideal would be re-formulate all possible philosophical

concepts (for example: truth, identity, necessity, knowledge, existence etc) using categories. In this sense, one could construct a *categorical theory of truth* , a *categorical theory of identity* proposing a new approach to classical philosophical notions.

Categoricism can generate a new tendency in analytical philosophy. If analytical philosophers apply logic to philosophy, the step to apply also categories is almost natural.

Philosophers known as logical atomists as Bertrand Russell and Wittgenstein have defended that there is a correspondence between the structure of propositions and the structure of the world. One could realize a project in the same direction arguing that the correspondence is between the structure of categories and the world.

This paper is an attempt to show how to realize some of this tasks.