Philosophica 67 (2001, 1) pp. 5-9

INTRODUCTION

Part of the tasks analytical philosophers set themselves is a critical assessment of the metaphysics of sciences. Three levels (or domains or perspectives) of metaphysics of sciences can be distinguished:
(1) *Specialized work.* On the one hand we have the study of the foundations of physics and the foundations of special sciences, and on the other hand there is work on specific subjects with their own distinctive metaphysical component: the nature of space-time (the foundations of relativity theory), the quantum paradoxes (the foundations of quantum mechanics and quantum field theory), the mind-body problem, the nature of causality, the nature of laws of nature, possible worlds realism, propensity interpretations of probability etc.
(2) *The realism-discussion.* Scientific realism – the view that the modal claims of our theories and the theoretical entities posited by our theories are out there in the world - was all but dead during the reign of the logical positivist consensus, but has come to the foreground again and with a vengeance. New kinds of realism are presented (e.g. structural realism, see below) and existing positions are refined. The constant rational questioning of local and global truth claims of scientific theories together with investigations into the nature of scientific truth and scientific objectivity leads to a better understanding of these truth claims.
(3) *Metaphysical hypotheses.* To a much lesser extent there are also proposals for comprehensive and totalising metaphysical systems based on our current scientific knowledge, for example Mario Bunge's *Treatise on Basic Philosophy.* We get an idea what the elaboration of a metaphysical system entails when we look at the subject matter of the seven volumes of Bunge's *Treatise*: the first two deal with semantics (sense, reference, interpretation and truth); the third and fourth volume are about notions like thing, property, etc. (basic ontology) and develop a systems theory; then follow two volumes of epistemology, one of them explicitly devoted to philosophy of science; finally there is a volume on

ethics.[1]

The first and the second domains are popular among philosophers. If we leaf through the *British Journal for the Philosophy of Science*, *Synthese*, *Philosophy of Science* and related journals we will find that many papers address realism and many papers address specific issues like the quantum paradoxes or the nature of space-time. It is the third domain that still remains unpopular. If we look at a book that assembles a collection of classic papers under the title "The ontology of science" (Worral 1994), then you see the book is divided into two parts: the first part is titled "The general issue of scientific realism" and contains papers of the second kind, the second part is titled "Some ontological issues raised by current science" and contains metaphysics of the first kind. It seems that only philosophers like Bunge or Apostel, people who have already done specialized work, can get away with papers on metaphysics of the third kind. But even then, this kind of scientific ontology or scientific metaphysics is not really mentioned in an anthology of recent classics on the subject.

One reason why the metaphysics of the third kind is so seldomly practiced is probably of a practical nature. Philosophy has become almost exclusively an academic enterprise and has adapted itself to university. In 1954 Gustav Bergman wrote:

> There was a time when a philosopher had to write books, or at least one thick book, if he wished to obtain a hearing for what was then called his system. This age is of shorter breath. Today many philosophers are content to pursue their education in public by means of the papers they insert in learned journals (Bergman 1954, p. v).

Instead of developing comprehensive philosophical systems, small papers are written on specific subjects. Authors have to know the subject they are writing about in great detail. The consequence has been a great level of sophistication and formal rigour. This is certainly the case for philosophical logic. But it can also be said regarding philosophy of science.

I will now take a look at each of the articles in this volume. The

---

[1] In Belgium there is the very similar system of metaphysics presented by Apostel in his 1963 and later in his 1995.

distinction between the three kinds of metaphysics of science will serve to classify the contributions.

Steven French's article is about a regional problem: space-time substantivalism. With the new model theoretic way of formulating space-time theories, the realism-issue has been given a new form. A space-time theory is a collection of models:[2] <manifold, geometric object, geometric object, ... >. For example, when we are modelling just time, then the manifold is R, the real numbers, where every real number represents an instant. In space-time theories the manifold is R^4: each point is labelled by a quadruple of numbers.[3] The question is: should the manifold be interpreted realistically? Steven French first looks at the problems with the concept of individuality in quantum mechanics. Interestingly, a similar discussion is possible with respect to space-time. Are the points of space-time individuals? One could argue against this, because they are all indistinguishable. And according to the generally accepted principle of the identity of indistinguishables, they must be identical. French also refers to the Hole-argument. The Hole-argument is a reductio-argument against space-time substantivalism. It becomes an argument for indeterminism if one accepts space-time substantivalism. French proposes a solution: we should not let the ontology of the theory be driven by a too literal reading of the mathematics (in this case set theory). Instead of using an ontology of individuals with inhering properties, we should work with an ontology of structure.

Quentin Smith defends the view that laws of nature are metaphysically necessary truths, by using the possible worlds semantics of modal logic. Metaphysically necessary truths are true in all possible worlds. It is meant as an alternative for regularity views (inspired by Hume), universals-accounts (a proponent of this view is D. M. Armstrong) ... It is clear that he takes laws to be fundamental for his ontology. Smith discusses the classical objections against the thesis that laws of nature are metaphysically necessary.

James Ladyman looks at some of the strongest arguments against

---

[2] See Norton 1992.

[3] The manifold is a set of points, with a topology defined on it. A typical example of a geometric object is a metric, which determines the distance between a point and the neighbouring points.

realism and asks if a form of realism is possible that avoids these criticisms. He also refers to the problem with classical notions of individuality in the context of quantum mechanics. Apparently physics underdetermines metaphysics. Similarly to French, Ladyman proposes structural realism as an alternative for traditional scientific realism.[4] Structural realism is the commitment to the theoretical *structure* of the theory. Lets take an example from physics. The state space of a classical entity is a set of states. The properties of this classical entity form a Boolean lattice. Structural realism implies that the Boolean lattice itself is ontologically basic: the entity *is* the structure. Relations and structures should not be interpreted as relations between objects or individual entities, but should be seen as basic reality. What about laws? Laws support counterfactuals and specify relations of necessity and possibility between events. The laws of a theory specify this modal structure in phenomena.

Steffen Ducheyne discusses the one metaphysics that concerns us all. The reason it concerns us all is the big impact Newton's scientific work has had on our culture. Maybe we can learn something from the metaphysics of the man who came up with classical physics in the first place. Ducheyne concentrates on the work of the historian of science James McGuire and claims that for Newton 'matter', 'god', 'active principles', 'being', 'space' and 'time' are intertwined in an onto-theological network. Furthermore, he defends the view that Newton was a realist with respect to space and time.

During the last years, I studied the work of Leo Apostel with a special focus on the metaphysics project of Leo Apostel. My own contribution first gives a framework for the presentation of complete and comprehensive metaphysical hypotheses. The rest of the paper is a first sketch of Apostel's metaphysical hypothesis within this framework. Different aspects of Apostel's philosophy are put together. Especially the concept of causality is important for a good understanding of his metaphysics. According to Apostel entities are causal agents, and causal relations are production relations between entities, where the causal agent produces a transformation in another entity, by exerting force. Everything that exists is a causal agent. I look, among other things, at Apostel's

[4] Traditional scientific realism is committed to an ontology of individuals with properties.

proposal to explain the 'being-thus' and 'being-there' of the world with Leibniz' principle that we live in the 'best' of all possible worlds.

As we can see the papers are representative of the classication I made earlier: French and Smith's papers belong to (1), Ladyman's paper can be classified under (2) and Ducheyne's and my own paper are definitely examples of (3). Hopefully this collection is representative of a future development: the constant interaction between and elaboration of the three levels of metaphysics.

Wim Christiaens (Universiteit Gent)

REFERENCES

Apostel, L. (1963), Can metaphysics be a science?, *Studia Philosophica Gandensia*, 1: 7-95, Gent. Reprinted in Apostel, L.: *Een zoektocht naar eenheid in verscheidenheid*, VUBPress, to appear.

Apostel, L. (1995), Symmetry and symmetrybreaking: ontology in science (An Outline of a Whole), in: The World-views Group (1995).

Bergmann, Gustav (1954), *The Metaphysics of Logical Positivism*, The University of Wisconsin Press, Madison, reprinted: 1967.

Butterfield, J. Mark Hogarth and Gordon Belot (1996) (eds.), *Spacetime*, Dartmouth, Aldershot.

Norton, John D. (1992), Philosophy of Space and Time, in: Butterfield, Hogarth and Belot 1996. Reprinted from Merrilee Salmon (1992) (ed.), *Introduction to the Philosophy of Science*, New Jersey: Prentice-Hall, pp. 179-232.

Worral, John (1994) (ed.), *The Ontology of Science*, Dartmouth, Aldershot.