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INTRODUCTION

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According to the members of the Vienna Circle, there was a strong connection between logic, reasoning, and rationality. They believed that human reasoning (and in particular scientific reasoning) is rational in so far as it is based on logic (which meant for them classical logic). It was also believed that scientific reasoning (for them the hallmark of human reasoning) was in general rational. In the second half of the twentieth century, both beliefs came under attack.

One of the motors for this change was the turn in history of science initiated by Alexandre Koyré. In the 'old history of science' success stories were told, usually on the basis of published papers and even textbooks, and only theories that had survived were considered (Galileo's law of free fall, Kepler's three laws, Newton's gravitation theory, and so on). Moreover, no attention was paid to mistaken paths, nor to the contexts in which the original theories were formulated and accepted. So, what happened was that nice and polished reconstructions of scientific episodes were made, with classical logic as the underlying logic, and that the results were deemed to be rational. In the 'new history of science', things changed radically. Theories were studied in their historical setting, and explicit attention was directed not only to theories that were abandoned (such as the phlogiston theory), but also to flaws, and to elements that played a crucial role in the construction of new theories, but that are today considered as non-rational. Examples are Kepler's work on

astrology and on the harmony of the spheres, and Newton's work on alchemy.

In the aftermath of Koyré, philosophers of science, such as Hanson and Kuhn, also followed this new trend and started basing their philosophical analyses on actual examples from the history of science. Two central lessons came out of all this. First, the so-called 'context of justification', which was the sole concern of the members of the Vienna Circle, is less straightforward and less 'logical' than was traditionally accepted. Next, the 'context of discovery' is much more structured and methodical than was believed within the Vienna Circle, even though it is not understandable from the point of view of classical logic. The conclusion was that logic is inadequate to explicate actual examples of human reasoning, whether in the sciences or in everyday life.

There were several reactions to this situation. Some scholars held on to the link between (classical) logic and rationality, but concluded that scientific reasoning (especially as it occurs in the context of discovery) is inherently non-rational or even irrational. Others gave up the connection between logic and rationality. They looked for tools elsewhere (mainly in psychology and cognitive science) to analyse the rational character of scientific reasoning, often at the expense of rigour and formal accuracy. Times have changed, however. Today, a multiplicity of formal frameworks (ranging from non-classical logics over probability theory to Bayesian networks) is available in addition to classical logic. Also, historians and philosophers of science as well as psychologists have described a rich variety of patterns in both scientific and common sense reasoning.

The aim of the congress *Logic, Reasoning and Rationality* (Centre for Logic and Philosophy of Science, Gent, 20-22 September 2010) was to stimulate the use of formal frameworks to explicate concrete examples of human reasoning, and conversely, to challenge scholars in formal studies by presenting them with interesting new examples of actual reasoning. This special issue contains a selection of papers on rationality and

justified belief presented at the congress. Other papers presented at the congress are be published in a book (*Logic, Reasoning and Rationality*, Springer) and in special issues of the journals *Foundations of Science*, *Logic & Logical Philosophy* and *Logique & Analyse*.

The first paper in this issue is *The problem of Kuhnian rationality* by Rogier De Langhe. According to Thomas Kuhn (1962/1970), science is characterized by two levels, one within and one between paradigms. The problem of Kuhnian rationality concerns the choice between paradigms, for which no rational basis appears to exist because this choice is inevitably circular to some extent. This is the main reason why Kuhn's view is perceived to glorify irrationality. Rogier De Langhe presents us two interpretations of the problem of Kuhnian rationality, one based on concepts (the neo-positivist interpretation) and one based on values. He also describes two notions of rationality, optimizing and satisficing. Neither interpretation supports the notion of optimizing, but the values-interpretation supports satisficing, suggesting that if Kuhnian scientists are rational, as Kuhn insisted, they are satisficers. An agent-based model demonstrates that aggregating the behaviour of satisficing agents can account for Kuhn's view on the dynamics of scientific change.

Adam Grobler is the author of the article *Fifth part of the definition of knowledge*. It is commonly accepted that knowledge is degettierized justified true belief. On the other hand, one can easily acquire degettierized justified true beliefs without any skill of applying them, whether in practice or in forming further justified beliefs. Such beliefs can hardly be called knowledge. He suggests, therefore, that information may count as knowledge only when it is structured so that it is applicable in the process of belief- or knowledge-formation. He attempts to reconstruct the required structure in terms of Wiśniewski's logic of questions and he suggests that in order for a belief to count as knowledge it is necessary to be able to place it in an erotetic argument.

The rationality of scientific reasoning in the context of pursuit: drawing appropriate distinctions is a contribution by Dunja Šešelja,

Laszlo Kosolosky and Christian Straßer. In their paper they aim to disambiguate between different notions of pursuit worthiness regarding scientific inquiries. To this end they propose a unifying pattern of pursuit worthiness: "It is rational for *Y* to pursue *X* if and only if pursuing *X* is conducive of the set of goals *Z*." By showing in which ways variables *X*, *Y*, and *Z* can be changed, they present different notions of pursuit and pursuit worthiness. With respect to variable *X*, they distinguish the pursuit of scientific theories, epistemic objects, and technological developments. With respect to variable *Z*, they distinguish between epistemic and practical pursuit worthiness. Finally, with respect to variable *Y*, they distinguish between individual and communal pursuit worthiness. By means of these distinctions the authors are able to explicate some of the major ambiguities underlying the concept of pursuit of pursuit worthiness, as well as to shed light on some confusions in philosophical literature that have resulted from their neglect.

In *Rationally evaluating inconsistent theories*, Erik Weber and Maarten Van Dyck try to find out the answers of the following questions: What happens if one applies the "evaluation methodology" of Theo Kuipers to inconsistent theories? And what happens if one applies the "problem solving methodology" of Larry Laudan to inconsistent theories? They argue that in both cases something unacceptable happens. First they show us that application of Kuipers' methodology to inconsistent theories leads to a methodological stalemate: inconsistent theories are incomparable to consistent ones. Then they show that according to Laudan's methodology inconsistent theories are always better than consistent ones. Finally, they offer partial solutions to these problems.

The congress was organised in honour of Diderik Batens. It served as an opportunity for him – on the verge of his retirement – to look back on his long and distinguished academic career and clarify his personal views to the audience. Among other things, Batens helped shape paraconsistent logic and was the founder of adaptive logics.

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