

## Introduction

Jitse M. van der Meer

*The Cognitive Claims of Metaphor* has become a classic paper in the philosophy of science and beyond. It was written by Dr. Mary Hesse in 1988 as the culmination of work on models and analogies in science begun in 1966. In 2000 sitting next to Mary Hesse at the dinner for the Scripture and Hermeneutics Seminar at Redeemer University College I asked her how she would assess the adequacy of a metaphor.<sup>1</sup> Returning the ball to my court, she responded “That is a good question. Why don’t you work on it”. In October of 2014 Dr. Hesse has reached the respectable age of 90 years. The editors of *Philosophical Inquiries* decided to devote a special issue in her honor. When they invited me to guest edit this special theme issue I decided to take up her challenge.

The authors of this theme issue share the view that metaphor is a characteristic of creative cognition that is manifest in language. Their common focus is on the question of assessment of the adequacy of metaphor when it mediates between any source and target. More precisely, the question addressed by the papers is by what standards a metaphor is determined to be acceptable or unacceptable, correct or incorrect, productive or unproductive given its selective and suggestive roles.

The importance of assessment of metaphor follows from the fact that the transfer of meaning it brings about involves a re-description of reality. Mary Hesse brought this out with great clarity in a discussion of reduction when she wrote,

Those (like philosophers) whose business is logic and argument are too prone to neglect the fact that there can be very important tendencies and plausibilities among ideas which are less than strict entailment, but which are highly influential upon thought, and are not simply exorcized by pointing out that they are not logically conclusive. We should look very carefully at such tendencies to see how far we ought to be pushed for good reasons to accept them, and how far we ought to resist them (Hesse 1985: 108).

<sup>1</sup> See Hesse (2001) for her contribution to this conference.

Hesse is observing that beliefs about or knowledge of extra-scientific source domains are required for the construction of scientific explanations, that the two can be separated because they are not logically connected, and that logical relationships between extra-scientific source and scientific target are not the only relationship at issue. In other words, while beliefs about or knowledge of the source function logically in arguments, they can assume other functions including ideological functions in what is more broadly speaking analogical reasoning. The question of evaluation arises because metaphor is inherently selective and, therefore, incomplete. Unsurprisingly, Hesse made her observation in connection with reductionism, that is the stance that mistakes a metaphor to be complete. Reduction or redescription of reality, Hesse argued, is a legitimate part of discovery. For instance, religion and morality can be redescribed as social or biological phenomena. This can be constructive if the social or biological redescription is seen as a partial description of religion and morality. But such partial descriptions become destructive when they are offered as complete characterizations.

In this theme issue, the question of assessment of metaphor is developed in the following directions. Paul Bartha introduces Hesse's challenge as the task to integrate the precision of meaning assumed in the logic of analogical argument with the variance of meaning associated with the metaphoric transfer of meaning in scientific discovery. Hesse attempted to overcome the tension between these logical and semantic roles of metaphor in the natural sciences. As Hesse gradually pays more attention to the variance of meaning, the logic of analogical argument moves into the background. Correlated with this development is a gradual reduction in the scope of analogical reasoning. Bartha sees her moving from the view that the logic of analogical reasoning in the natural sciences has general application outside of science to the view that it has limited application within science. As a result, she moves away from a normative theory of analogical reasoning towards a psychological or cognitive model of the cognitive processes involved in analogical thought. Bartha offers three options for escaping the horns of Hesse's dilemma and proposes a normative theory of analogy.

Anke Beger and Olaf Jäkel take an empirical approach to the assessment of metaphor in science education with examples from molecular biology, evolutionary psychology, nuclear chemistry, social psychology and philosophy of mind. By analysing the linguistic manifestations of metaphor, they show that metaphor operates both in discovery and learning, that it produces cognitive change, that cognitive change can involve misconception, and that the pedagogical use of metaphor is deliberate. An effective explanation must connect with a source domain already present in the recipient. This is a challenge be-

cause teaching usually engages students with diverse background knowledge.

Elaine Botha suggests that the grounding of metaphorical meaning in neural processes by Lakoff and Johnson is open to subjectivism and materialism. Subjectivism can be avoided, she suggests, by providing an ontic ground for the embodied conceptual structure of metaphor. This ontic ground consists of a stratified world with ontic analogies between the strata. This world incorporates human experience which, therefore, also has an analogical structure correlated with that of the world.

Evelyn Keller asks how the metaphors scientists use shape our scientific view of the world. Her thesis is “that the central metaphors of classical and molecular genetics contributed greatly to the successes of these fields,” that these same metaphors fostered “the neglect of crucial questions about embryonic organization and regulation” and that a new metaphor of the genome as a ‘reactive system’ is required to move forward. The failing metaphor is that of the gene as an agent making a product. The geneticist Thomas Hunt Morgan (1934) had proposed that differences in cytoplasmic composition of the egg could account for differences in gene activity. This linked the genetic question of how genes produce their effect to the embryological question of how cells become different in the course of development. Subsequent elaborations of this proposal in embryology neglected the agent role of the gene and this is seen as contributing to its failure. It was revived upon introduction of a new metaphor from computer science – the computer program. Cell differentiation was reconceived as controlled by a genetic program for the control of gene activity. Further, a genetic program could be linked to embryology by conceiving it as a developmental program in which master genes regulate which genes would be active when and where in the embryo. Evaluation of this metaphor reveals the role of narrative, specifically the narrative that seeks to understand what is perhaps the most fundamental question in the philosophy of biology, namely that of the identity of living things. It turned out that the master gene does not control identity. For instance, the master gene controlling the program for eye development in a fly can just as well control eye development in a mouse without turning it into a fly’s eye (Keller 2000: 73-101). So far the program metaphor has failed to account for the identity of organisms. This assessment of the computer program metaphor includes the extent to which it fits with the narrative of the genetic control of development and is able to create what Keller calls ‘the illusion of explanation’. Keller’s analysis of the neglect of crucial questions shows that metaphor is assessed not only in terms of its productivity or purpose, but also in terms of its fit in a research tradition with its particular narrative.

Nancy Nersessian asks how we can create genuinely novel concepts and understandings given that we must start from existing representations.

Drawing on historical and ethnographic research practices, she shows that Hesse's family resemblance notion has a key role in capturing the dynamics of concept representation and of analogy for model-based reasoning processes in concept formation and problem solving more broadly. Two components of this program are the "family resemblance character of concepts and consequent analogical nature of inference" (Hesse 1988a: 337-338). Nersessian proposes that, instead of mapping and transferring features directly to the target, specific constraints of a source domain are abstracted on the basis of, and combined with, constraints stemming from the target to create intermediary, i.e., hybrid models, which in turn possess their own constraints. The intermediary models serve as analogical sources for the target problem with dynamic interaction between model and target. The hybrid models afford exploring novel combinations of constraints not represented in either target or source domain, and thus genuinely novel representations, including novel concepts, can emerge. Their empirical adequacy in solving a specific problem at hand is assessed continually.

Jitse van der Meer covers the cognitive role of metaphor in the transfer of meaning between religion and science using Christianity as a case study. He proposes that metaphor can mediate between science and the Christian religion and satisfy Hesse's requirement that their relative independence be respected. After summarizing Hesse's views on science and religion, he shows that standards of assessment of metaphors that mediate between science and religion are needed. Two sections follow assessing the applicability of contemporary conditions for the adequacy of metaphor in general to the mediation between science and religion. He then introduces standards by which to assess the mediating role of metaphor in the engagement of science and Christianity. Attention is given to error correction as well as to its failure in ideology and strategies for correction of the latter. He concludes that the possibilities for metaphor to mediate between science and Christianity are limited, but that it is possible while respecting the integrity of both.

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