**ABSTRACTS**

**B1.1 Methodology**

**Contexts for philosophy: How can novel contexts in synthetic biology help philosophy of science?**

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Synthetic biology is a novel interdisciplinary field that combines the expertise of biologists and engineers among others. There is, however, some worry coming from philosophical discussion and from our collaboration with synthetic biologists as to what exactly is philosophically new or interesting in synthetic biology? We argue that synthetic biology can be used as a source of concrete examples that provide a more fine-grained analysis of questions of philosophy of science, as well as offer new insight on the question of interdisciplinary collaboration.

To start off, we provide some general remarks concerning the philosophical relevance of case studies and examples. In particular, we analyze how in philosophy of science concrete examples can be used to contextualize and elaborate philosophical ideas. In this manner, new fields like synthetic biology can provide new contexts for philosophical analysis. These novel contexts can provide constraints through details for philosophical questions, and may lead to reconceptualization of these questions as well as bring about novel ones.

In this spirit, we provide an example of such a context in synthetic biology: the difference between engineers and biologists in terms of how they conceptualize and form their systems. Engineers seek to specify their systems to such a degree that the system behavior can be effectively predicted and controlled. Biologists on the other hand tend to focus on more general features of the system and are happy to leave in unspecified parts. Philosophical analysis of contexts can help alleviate these tensions and provide valuable philosophical insights to the methodology of science. This has relevance for successful interdisciplinary collaboration in synthetic biology.

**A Hessian Approach to Analogical Reasoning in Theory Construction**

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In the philosophy of science, with a few exceptions, works on analogy have been relatively few since Mary Hesse’s classic work, Models and Analogy in Science. The goal of this paper is to combine a theoretical framework with a detailed analysis of historical cases and to explore the role of analogy in (scientific) theory construction. In this paper, we use Hesse’s original understanding of analogical theory construction to develop a related framework. We call it Hessean approach. Give there are many approaches such as the probabilistic, the cognitive, and the computational ones, we select Hesse’s approach for two main
reasons: First, by a preliminary comparison with the other approaches, we think that Hesse’s approach is more natural than others are. Second, Hessean approach is more suitable for investigating the role of analogical reasoning in theory construction than other approaches are. In order to sufficiently exploit the potential of Hessean approach, our framework revises Hesse’s original in the two points: First, we drop the “formal” and “material” name tags, and view analogy as both the structural correspondence and pretheoretic similarities between two analogues. Second, we develop three new symbolic schemas by modifying and extending Hesse’s original schema. In order to show the virtues of our framework, we illustrate our proposal through the analysis of two famous case studies: the construction of Coulomb’s law and the construction of Darwin’s theory of evolution by natural selection.

**A Frame-Based Approach for Operationalized Concepts**
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According to a seminal paper by Lawrence W. Barsalou (1992), frames are attribute-value-matrices for representing exemplars or concepts. Furthermore, frames have been proven to be a very useful tool for reconstructing scientific concepts as well as conceptual change within scientific revolutions as a field of interest for philosophers of science. In frame-based representations of scientific concepts developed so far the semantic content of concepts is (partially) determined by a set of attribute-specific values. In addition to the semantic content of concepts, frames can also contain empirical knowledge that is represented as constraints between the values of the frame. This way of representing concepts works best for prototype and well-defined concepts.

Beside prototype and well-defined concepts, in science operationalized concepts play an important role. However, so far no frame-based representation of operationalized concepts has been developed. In my talk, I will show that frame-based representations of defined and prototype concepts have a different structure than frame-based representations of operationalized concepts. In order to explicate this difference in structure, I will develop a frame-based method for representing prototype, defined, and operationalized concepts by means of mathematical graph-theory. Proposing that frames are mathematical graphs will provide a frame-based explication of the difference between prototype, defined, and operationalized concepts including all advantages of frame-based representations in general. One important consequence will be that the constraints of a frame representing an operationalized concept are entailed by the structure of the frame as opposed to a frame representing a defined or a prototype concept.

In order to illuminate the idea of operationalizing frames, I will introduce a multiple operationalized concept of the linguistic theory of generative grammar according to N. Chomsky and provide a frame-based representation of this concept.