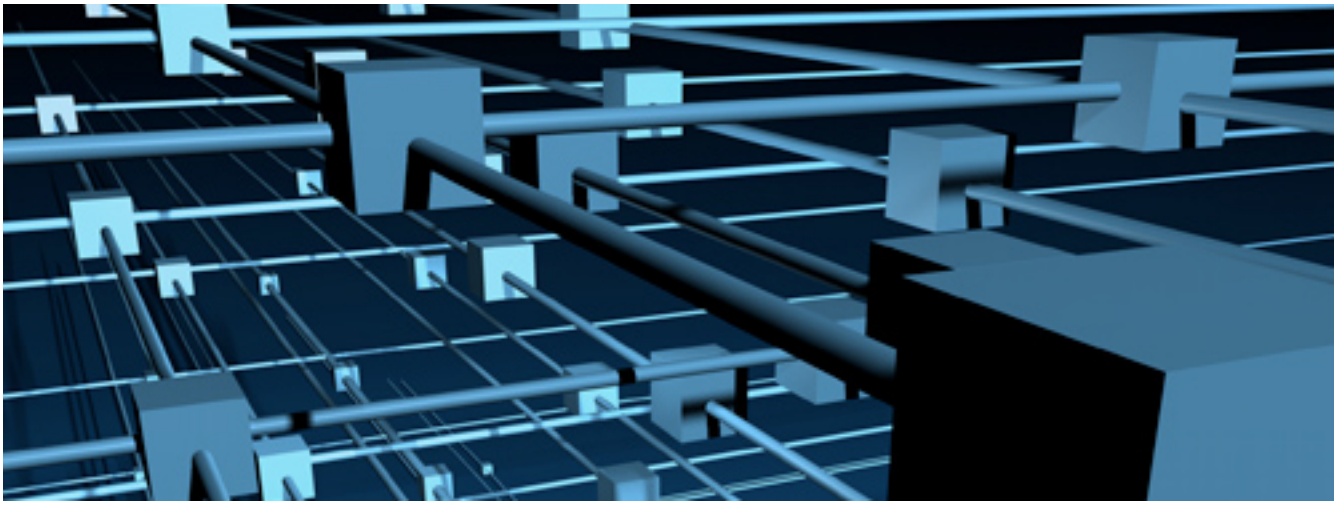
Complexity and Analogy in Science: Theoretical, Methodological and Epistemological Aspects



In the past decades scientific investigations have been quite successful by reductionistic research approaches. But scientists are ever more aware that their specific knowledge obtained so far will have to become integrated into a more holistic understanding of the reality of nature, which shows ever higher degrees of complexity and analogy. Evidence of this can be found, for example, in micro and macro physics as well as in biological systems. The Council presumes that most of our Academicians will be able to contribute with their personal view and experience to the proposed topic. This can offer a welcome occasion to learn from one another and to outline promising approaches for future scientific investigations.

The concept of complexity in science has many different meanings with regard to theoretical, methodological and epistemological aspects, while its basic meaning remains stable. It is, first of all, the theory of nonlinear complex systems, which is used with regard to physics and quantum systems as well as to cellular organisms and the brain. The aim of the Plenary Session is to explore the important concept of complexity in science in general and in different scientific disciplines. Are the concepts used analogous, or can a phenomenon be, for instance, complex from the biological point of view, but not from the physical one? Shall our practice just ignore problems we cannot currently handle – or can science render apparently complex systems in simple underlying theories? Furthermore, is there a difference between complex and complicated such that some complex systems are not actually complicated even though all complicated systems are indeed complex? In general, complexity has become an important area of research in several disciplines in the last decades. For instance, the complexity and the ensuing

unpredictability of weather systems has been known for a long time.

In systemic approaches to fully understand functions and evolution of life, one may have to consider each individual organism as a complex system of biological functions, then each ecosystem as a complex system of mutually interactive organisms belonging to different species, and finally, the entire living world together with its different habitats as a large planetary system of steady, but slow, co-evolution.

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