



Evolving Concepts of Nature



Right from the roots of cultural evolution of mankind, testimonies can be found of early and of later modified and updated world views, that must be based both on careful observation of nature and on beliefs. The Chapter of Genesis is a good early example. In the course of time, and in particular in recent centuries with more and more sophisticated research methodology, available scientific knowledge and propagated world view became stepwise adjusted and extended on the basis of novel scientific insights. Human curiosity is the driving force for this development, in which belief systems and philosophy still have their valid place.

Already Heraclitus stated: "Nature loves to hide". Most scientists today are likely to subscribe to this dictum. We know indeed that by far not all questions asked with regard to natural mechanisms, processes and properties can easily find answers. This may be due to several reasons. Available research methodology may not be appropriate. But more importance can have in the meantime the established insight that nature is not static, but dynamic, it occasionally undergoes changes. This has been revealed both for cosmic evolution and for the evolution of life. This situation can render the identification of universal laws of nature difficult. For example, recent investigations on biological evolution have revealed that nature actively cares for a slow, but steady progress of evolution towards a richer and more sustainable biodiversity. In this process many specific molecular mechanisms are at work and different kinds of organisms may use different such mechanisms. A philosophical conclusion of this knowledge may be: "Nature is very inventive and able to find different ways to reach a specific goal". We natural scientists consider such successful processes as "self-organization". One of the consequences of such natural, often conjectural, processes is that specific molecular mechanisms may differ in different kinds of organisms, i.e. what has been established for a model organism will not be valid for all kinds of

living beings. Nevertheless, we can admit that identified general and overarching laws of nature hold universally and that it is the particular details that manifest specific, alternative processes reflecting specifically valid laws of nature.

In its cultural evolution mankind has learned to apply acquired scientific knowledge for the benefit of its life and of our environment. In order to prevent conjectural risks of such mostly technological applications, it is advisable to take care that any envisaged application does not violate the relevant laws of nature. In addition, the resulting “invention” should be carefully screened for its potential effects on natural harmony before its wide use. These precautionary principles render the knowledge of general and of specific laws of nature particularly valuable with regard to the long-term sustainable development of humanity in a healthy environment.

In its next Plenary Session the Pontifical Academy of Sciences intends to collect input from a wide range of scientific disciplines on actual and also historically documented updating of the prevailing concepts of nature. The resulting documentation can be welcome for formulating recommendations to the Church and to the political world as a basis for the future progress of our cultural evolution.

Werner Arber