jects. But as time passes, our observations and experiences build up, our knowledge about objects and phenomena grow deeper, and each of us discovers that in the world, everything is interconnected. We discover fundamental connections and relations between objects, phenomena, and processes.

The interdependence of objects and phenomena in the world is not of a single form. The division between objects associated with one form of connection and objects associated with another form of connection is clearly delineated. Even the connections are determined by the difference in the characteristics of the objects. Thus the concept arises of a collection of a specific set, which is defined as a *species* or *type*. This concept already is not an abstract notion of "many" in which qualitative content has been dissolved nor of an "individual" devoid of internal parts; it is, in fact, something special, appearing simultaneously as "many" and as "individual." In *Categories* Aristotle noted that a type, and even more so a species, is that which reduces a set to one essence (Aristotle, 1979). Aristotle's contemporaries also understood that the concepts "species" and "type" contain something reflecting an objectively existing common element, that is, an interrelated set. Consequently, the common element contained in an interrelated set can be considered something unified, and this unified thing began to be expressed by the concept of a "whole."

According to Aristotle, the whole is that for which none of its parts is lacking, in the composition of which it is referred to as the "whole" from nature, as well as that which includes its objects in such a way that they create something unified (Aristotle, 1956).

Although a whole is broader in content than the concepts "species" and "type," it still reflects a specific class of an interrelated set. It distinguishes a set whose characteristic is a certain completeness or finality. In addition to the set as a whole, a "nonwhole" set also exists.

The ancient philosophers were not destined to develop a concept that would reflect any delimited interrelated set. Much later the notion became the concept of a "system." The ancient philosophers, in particular Epicurus, used this earlier concept to designate a specific sum of knowledge (Epicurus, 1963). In the following centuries, philosophers and naturalists, while continuing to use the concept "system" chiefly to designate a sum of knowledge, at the same time used it to define material aggregates. Thus, for example, Holbach viewed the objective world as a system of systems. In this connection he identifies the concepts "system" and "whole" (Holbach, 1963).

One of the first definitions of the concept "system" is given by Condillac in his treatise on systems. "Every system," he writes, "is none other than a configuration of various parts of some art or science in a certain order, in which all parts mutually support each other and in which the latter parts are enveloped by the first" (Condillac, 1958). Already this definition emphasizes the presence of connections, order, and interdependence in a system.

With the development of natural science, the idea about the unity of the laws of functioning as applied to various systems increasingly got hold of the minds of scientists. The avalanche of investigations of systems, which has been growing since the 1950s, is pursuing basically one goal—to find and substantiate common regularities of the operation of technical, biological, linguistic, economic, and other systems.

Intensive investigation of systems in various branches of science inevitably posed scientists with the problem of defining the system as a concept. What, properly, does the concept "system" reflect, what reality? L. von Bertalanffy, the founder of so-called *general systems theory,* defines a system as a complex of elements in interaction (von Bertalanffy, 1969). This idea is essentially developed also by one of the leading theoreticians of the systems approach, Russell Ackoff. He assumes that a system is a set of interacting elements, where each element is connected directly or indirectly with every other element, and any two subsets of this set cannot be independent (Ackoff, 1962). Not satisfied with this concept of a system, researchers in different sciences define it by taking into consideration the specifics of the subject of investigation. However, at present no single generally accepted concept of "system" exists. In this exposition of the material, we will confine ourselves to the following widely accepted definition: *A system is a complex of interconnected elements intended for fulfillment of a whole function.*[1] In this connection we will consider a system as consisting of those and only those elements that permit it to fulfill its whole function.

The common item in any of the definitions is that any system consists of elements. In this connection, an element within the limits of validity of a specific given property of the system is thought to be further indivisible. But indivisibility of an element is relative. The element itself can constitute a system and in turn also consist of elements. In other words, an element as such in an absolute sense does not exist outside a system.

Strictly speaking, a connected whole is formed by the elements integrated into our surrounding world, which is the only thing that can strictly be considered a system. However, to solve many theoretical and practical problems it is fruitful to consider as a system less grandiose unions of elements, such as a clock mechanism or a growing tree. A criterion for separating the collection of elements in a system is the degree of connectivity of those elements within the system and of the system with the outside world. The more united elements within the system, and the more isolated this collection of elements from the outside world, the more basis to consider the collection as a system.

It should be emphasized that it is not always the case that a delimited collection of interconnected elements forms a system, that is, could be considered as a system. *To be a system is not the property of an object.* In various problems and

[1] See details about the function of a system in Chapter 4.