machines, and "information" was said to mean those signals received by a system (whether the system was alive or not, without distinction), which changed the state of the system in a definite way. In terms of the concept "information," now doubts were arising about its connection with meaning. However, the new ideas turned out to be so important and fruitful that exactly this understanding of the term became widespread and customary for specialists in many fields.

Using the term "information" in his work, Shannon departed significantly from its commonly accepted interpretation. He now did not take meaning into consideration at all, and he was not interested in whether the information would ever be used. What interested him was precisely the transmission of information in communication channels, with the least possible loss and distortion. This position is completely understandable, because during the transmission of information, the question about its content does not even arise. Shannon's article (coauthored with Weaver) was titled "A Mathematical Theory of Communication," and one of the main problems solved in this work was the removal of the effects of noise during the transmission of communications.

In this work, Shannon proposed a probabilistic method of measuring the amount of information in a communication (information, not meaning!). The expression that he proposed for calculating the maximal capacity of a communication channel is one of the most important contributions to the theory of communication. It establishes the greatest amount of binary units (bits or "yes-no" solutions) that can be transmitted along a channel for a unit of time with probability of error as small as desired. This maximal speed of the transmission of information can be approached without limit by improving the coding method, but it cannot be surpassed.

The problems Shannon solved were significantly narrower than those solved by Wiener and became one of the parts of cybernetics (i.e., the direction of scientific investigations resulting from the work of Wiener). However, it is Shannon's work that served as the foundation for modern means of communication—*those means which are used to transmit information to the users.*

The probability-statistical theory of information (as Shannon's theory is often called) was only the first and most important among other mathematical approaches to the measurement of information. In the combinatorial approach, for example, the amount of information is defined as a function of the number of elements of a finite set in their combinatorial relations. Representatives of the topological approach introduce spatial structures, in particular graphs, as the basis of definitions of the amount of information. In the algorithmic approach, the measure of the amount of information contained—for example, in object A with respect to object B—is taken as the minimal "length" of a program on the basis of which object A can be unambiguously transformed into object B.

At practically the same time, biologists also introduced their contribution to the departure from the accepted meaning of the term "information." They began to refer to inherited traits as information. In this case, information was

transmitted by an especially material object (that is, by the DNA molecule) without any technical lines of communication, certainly not in the brain. In every case, having received a molecule of DNA, the object did not realize that it had received information, in whatever sense of the word.

The wide and diverse use of the term "information" is of interest to philosophers. An extensive literature dedicated to this concept has appeared. In attempting to recognize and generalize its varied uses, philosophers proposed new interpretations that only widened the circle of meanings for this term. For example, representatives of neothomism asserted the transcendental nature of information. In neopositivism and existentialism, information is considered a subjective phenomenon, among other things. The subject area of the concept of information is intensively discussed (is it a property of all material objects, of only of those that are living and self-governing, or only of conscious beings, etc.). The idea of diversity, proposed by Ashby (1964), proved to be rather widespread among philosophers. Investigating properties of information, he noticed that information cannot be transmitted in a larger amount than the amount of diversity permits. He formulated the idea of necessary *diversity,* the essence of which is that the receiving system increases its internal diversity as the diversity of the external influences decreases. This approach did not so much bring clarity to the understanding of information, as returned it somewhat to its original meaning and most of all pointed out its role in the survival of a system.

Thus, the varied uses of the term "information" have served as a basis for its transformation from a term rarely used or understood—and not attracting attention to itself over the course of many centuries—to a term extremely current, debatable, and surprisingly widespread. It may be useful (and interesting) to mention several definitions given for information, including the definitions by Wiener and Shannon. "Information is the designation of the content obtained from the external world in the process of our adaptation to it and the adaptation of our senses to it," wrote Wiener (1954).

"In general, information . . . can be defined as that which remains invariant under any reversible recording or transfer of communication," noted Shannon (1951). Brillouin wrote, "Information is a raw material and consists of a simple collection of data, whereas knowledge assumes some reflection or reasoning organizing the data by means of their comparison and classification" (1964). In discussing information in Shannon's terms, he noted, "We define information as the result of a choice; we do not consider information as the basis for a prediction, as a result of which it can be used to make another choice. We completely ignore the human value of information" (Brillouin, 1963). Further, "We attach to the word 'information' a precise but in fact limited meaning. We connect information with negentropy, and consequently, with improbability. . . . In this definition in reality there is nothing of life (the human element), and we will never confuse our information with science or knowledge" (Brillouin, 1963).