colonizing this region, mutant forms will usually arise that are still more resistant at elevated temperatures. Thus the zone will be colonized, which corresponds to a temperature of about 40° C up to a zone with a temperature of 80° C. In fact, thermophile bacteria can be observed in hot springs, existing in conditions that would seem incompatible with life. Moreover, these bacteria cannot even exist in conditions lower than 30° C. They would need to mutate again.

These examples of a species' mechanisms for survival can be considered as models that are, to varying degrees, characteristic for all forms of life in general and for humans in particular. The human organism contains no fewer than 100 types of different cells that are joined into tissue and organs to form one whole. It is known that cell repair takes place in almost all tissues of an organism, although at different rates. Thus, the lifetime of mucous membrane cells in the small intestines is a day, of skin cells the lifetime is from 5 to 35 days, and of liver cells it is 180 days. The total number of cells to have been a constituent part of an organism during the course of its life is an astronomical number, about 10^{18}. Each day approximately 10^{12} cells divide, and among every million dividing cells is one mutationally changed cell that does not resemble its related cellular environment. Considering that if in the course of a life 20,000 cell generations are replaced, the collection of mutationally changed cells will equal nearly 20 billion. Obviously, it does not mean that human mutation is mandatory and easy. Immune protection is the force that destroys mutated cells. However, several factors, such as specific changes in the external environment, can influence this protection, and a species can adapt to new conditions of existence. We say "species" and in this connection recall that an "organism" of a species consists of living individuals. Thus, we proceed with our consideration of a person as a functioning, balanced system.

To preserve the balance, that is, the normal course of all processes, the system needs matter and energy. For example, both are needed for cell repair. Clearly, the system's habitat is the source of its necessary resources. It is also obvious that this environment is not some nourishing broth, and replenishing these resources requires some effort. In other words, to obtain what is necessary from the outside, the system must in some manner contact its environment, and frequently these contacts require a significant expenditure of energy. It is also clear that these contacts must be purposeful and coordinated, not random, haphazard, and undirected. For this reason the system has a subsystem, called a *nervous system,* whose function is to control and direct the system, including the system's interaction with the external environment. We will discuss in some detail how this is carried out.

The diversity of the external world and the change in our internal states are detected by a system (an organism) with the help of a very large number of *receptors,* special biological monitors that react by an electrical impulse (signal) to specific changes either in the external environment or in the internal states of the system. Note that the receptors in a human being number into the billions.

Receptors in a system are divided into two groups: the first is the *exteroceptors,* which translate stimuli perceptible from the outside (from the habitat), and the second is the *interoceptors,* which perform the same function within the organism by scanning all of the organism's subsystems. The arising signals (nervous stimulations) are transmitted to the central nervous system, which consists of the spinal cord and brain. Different parts of the brain are responsible for different functions, and different receptors transmit signals to different parts of the brain. Incoming signals from interoceptors communicate about deficiencies of matter and energy, and those from the exteroceptors communicate about the situation in the habitat.

Signals from the interoceptors entering into specific parts of the brain cause stimuli in these parts, that is, they perturb specific *neurons* of the brain (brain cells). A characteristic property of neurons is that the electric potentials (signals) developed by them during stimulation are not distinguished by magnitude; the signal equals either zero or its maximal value. This means that neurons "work" with the help of binary input—they are either perturbed or not, either 1 or 0. Perturbed groups of neurons produce a pattern in the brain (that is, they *concretize* a problem, such as the organism's need for matter). Thus, the place where the pattern arises and its form correspond to a specific problem of the system and indicate exactly what the system needs.

The development of the pattern activates brain activity—that is, the *psyche* begins to work—allowing the system to feel and to comprehend. The purpose of mental activity is the elimination of a problem arising in the system. Therefore, mental activity is directed to the search for an algorithm for the system's behavior, behavior contributing to the achievement of the goal. The first step of mental activity is addressing a region of the brain such as the memory. The memory stores knowledge (i.e., patterns) of those problems that arose earlier, and the system's behavior algorithms correspond to these problems for specific conditions of the external environment. The latter is extremely important, because the problem is eliminated in the process of interacting with the environment and depends on the behavior of the system in a concrete environment. Thus, the signals about the external environment, perceivable by other parts of the brain from the exteroceptors, are absolutely necessary.

In those cases when both the problem and the state of the habitat are known to the system, that is, when analogues of interoceptor and exteroceptor patterns are in memory, and when the systems' memory contains a prepared behavior algorithm (also a pattern), the brain communicates signal to specific subsystems (organs), and this begins the process of a system's conscious behavior (activity). Here a mental process is carried out in a somewhat different form. After the beginning of the activity in this process, control of each stage of activity is carried out (constant feedback that considers changes of the external environment as well as the intermediate results of the activity, which can lead to correction of the behavior algorithm) until the problem is eliminated.