The hypothalamus functions as a principal regulating center for the autonomic nervous system, and controls and coordinates the activity of the autonomic reflex centers in the pons and medulla. The hypothalamus also plays a key role in the regulation of body temperature (p. 672) and the osmolarity of body fluids (p. 492). Sensations such as thirst, hunger, and sex drive are associated with specific regions of the hypothalamus, as is the feeling of wellbeing when these drives have been satisfied. The hypothalamus and the brain stem are the brain regions that are the most important for regulation of homeostasis.

The Cerebrum

In comparison with other vertebrates, the ability of the most advanced mammals to choose between alternative behavioral patterns in given situations is highly evolved. This flexibility is due to the ability of the brain to evaluate the present situation on the basis of prior experience before making decisions. This analytical capacity provides advanced mammals with a significant competitive advantage over animals exhibiting more automatic behavior. However, this type of adaptable behavior is only possible if the brain has access to information about the surroundings and the state of the animal, via the sensory organs, as well as stored information about prior experience. When the available information has been analyzed, the brain must also be able to control the animal's behavior. In humans, the term "consciousness" is used to describe the close connection between sensory input, stored information, and behavior. In humans, the ability to think analytically is combined with an abstract language that makes exchange of ideas possible. This combination has provided humans with the ability to perform intellectual and artistic activities. We also have direct, voluntary control over the muscles of our hands, which are effective implements for manipulating our environment. These innate abilities of humans have enabled us to develop tools and technology, complicated social structures, and the patterns of living that we call culture.

Different animal species probably possess varying levels of consciousness

It is not clear to what extent consciousness is present in other mammals. However, as is the case for other physiological functions, it is likely that this characteristic differs between mammalian species more in terms of degree than by its absence or presence.

The unique analytical abilities of mammals are tied to the cerebrum

The unique analytical abilities of mammals are tied to the cerebrum, which, because of the considerable growth of the neocortex, represents the largest part of the brain in most mammals. There is large inter-species variation in the relative size of the neocortex (Fig. 4.36). In insectivores, the neocortex comprises 8–20 % of the brain weight, while the corresponding figure for humans is 76 %. In large ruminants and predators, the relative size of the neocortex is about 70 %, while in sperm whales, it constitutes 87 % of the brain weight.

The neocortex is the largest part of the cerebrum in advanced mammals

In fish, amphibians, reptiles, and the most primitive mammals, the most important function of the cerebrum is to receive and process olfactory information. In mammals, this task is performed by the ventral part of the cerebrum, the *rhinencephalon*. The cerebral cortex in mammals also receives, via the thalamus, all other types of sensory information about the envi-

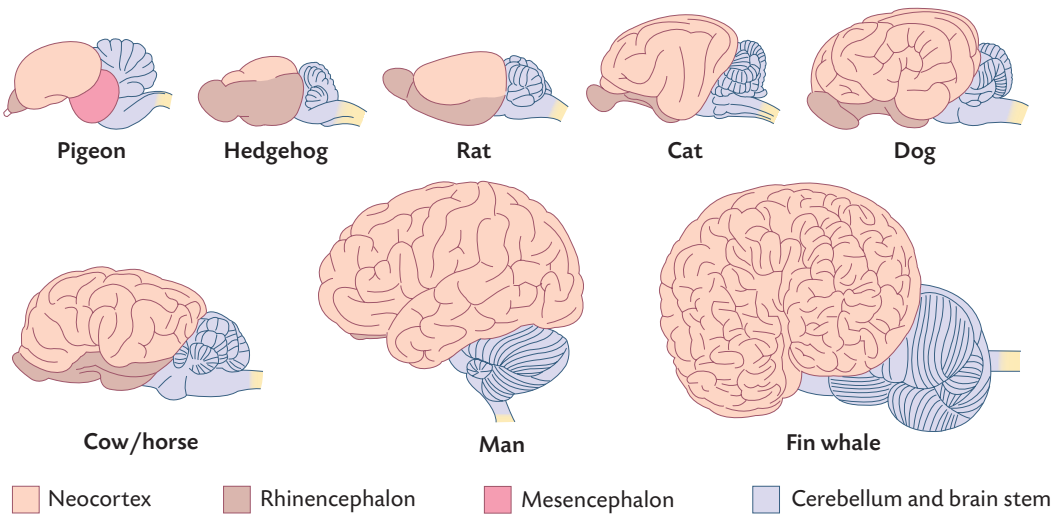

Figure 4.36 The size of the rhinencephalon (olfactory brain) relative to the rest of the cerebrum in birds and selected mammals. The formation of gyri by convolution of the cerebral cortex increases with brain size. Modified from Nieuwenhuys et al., 1998.