

## Knowing Your Brain

This heading is actually a misnomer because in so many ways, the more we learn about our brain the more questions arise. Although we have learned more about the brain in the past 20 years than in previous history, and although there are many ground-breaking experiments going on, there are many aspects of the workings of the brain that scientists have yet to unravel. Some questions include how our brain processes information, how memories are stored, how the brain develops and grows and how we consciously think. Neuroscientists all over the world are working on the 'neural decoding' of the brain and many mysteries have been unlocked over the past decade. It is expected that with technology constantly improving many more questions will be answered over the next 10-20 years.

An adult brain weighs about 2 per cent of a person's body weight – about 1-2kg – and it is made up of billions of nerve cells, called neurons, packed into the limited space of the skull (about 1400 cubic centimetres of space). As your brain grows it folds in on itself and develops ever deeper folds creating fissures so that it begins to look like a wrinkled walnut. This makes the brain more efficient because these foldings increase the surface area of the cortex and although the foldings may seem to be haphazard, they are quite uniform and are useful landmarks for working out the general location of functional areas of the brain, such as hearing, vision and speech.

Our brain controls and checks the life processes that continue without our being conscious of them. These include breathing and heart rate and the co-ordination of most of our voluntary movement.

Although our brain works as an interconnected whole, there are roughly three main areas which have different functions and produce different aspects of the mind. These anatomical structures are *the central core, the limbic system and the cerebral cortex*.

*The central core (which includes the brain stem)* regulates, amongst other things, breathing, heart rate and digestion as well as movement, balance and sleep. These are the basic life processes.

*The limbic system* is often called the "emotional brain". It regulates body temperature and blood pressure, etc. and is linked to hormones and emotion and also memory processes.

*The cerebral cortex (ie the cerebrum or forebrain along with its covering, the cortex)* is the area that takes charge of high-level functions including our cognitive and emotional areas. *The cerebrum* is divided into two fairly equally sized hemispheres known as the left hemisphere and the right hemisphere. They look after all forms of our conscious and unconscious processes which include planning and decisions and our judgement and problem-solving abilities, including complex calculations and our ability to communicate. Although they look very much the same, each hemisphere has a different

job to do. The left hemisphere manages the right side of the body. In most people it tends to be the most dominant and is important in communication, controlling language and playing a central role in the complex task of reading. It is also logical and systematic, specialising in detailed analysis. The right hemisphere controls the left side of the body and specialises in holistic processing, analysing and processing information from the outside world such as understanding what we hear, making sense of patterns of sight such as face recognition, understanding geometric shapes and appreciating music. It is imaginative and intuitive and concerned with emotions and feelings. Although the two hemispheres have different functions they are continually communicating through a thick band of nerve cells, co-operating with and supplementing one another, working as a team rather than separately.

Research has shown that people's brains are very much the same but there are some minor differences. One of the most obvious is that over 80 per cent of the population are right-handed and others are predominantly left-handed. As just mentioned, the ability for communication is mainly localised in the left hemisphere. Although the right hemisphere can understand written and spoken language to some extent, it is not now thought that left-handed people are merely mirror-images of right-handed people. Scientists know that hand movements depend on the left hemisphere of the brain but they are still exploring the question of how the brain of a person who is left-handed is different from a right-handed person.

It is also well-known that the brain of a male works differently in some ways to that of a female. It is the subject of many a light-hearted conversation in mixed company. There are differences in size of some areas of the brain between the sexes and overall a male brain is about ten per cent larger than that of a female reflecting a difference in body size. The female brain, however, contains more cells in certain areas. Other differences between male and female brains seem to relate to brain organisation as some processes are carried out in different parts of the *cerebrum*. For example, with speech, the frontal area seems to be more important in women and in men, if anything, the back part is more important. Generally, women perform a little better with words and men slightly better at spatial skills.