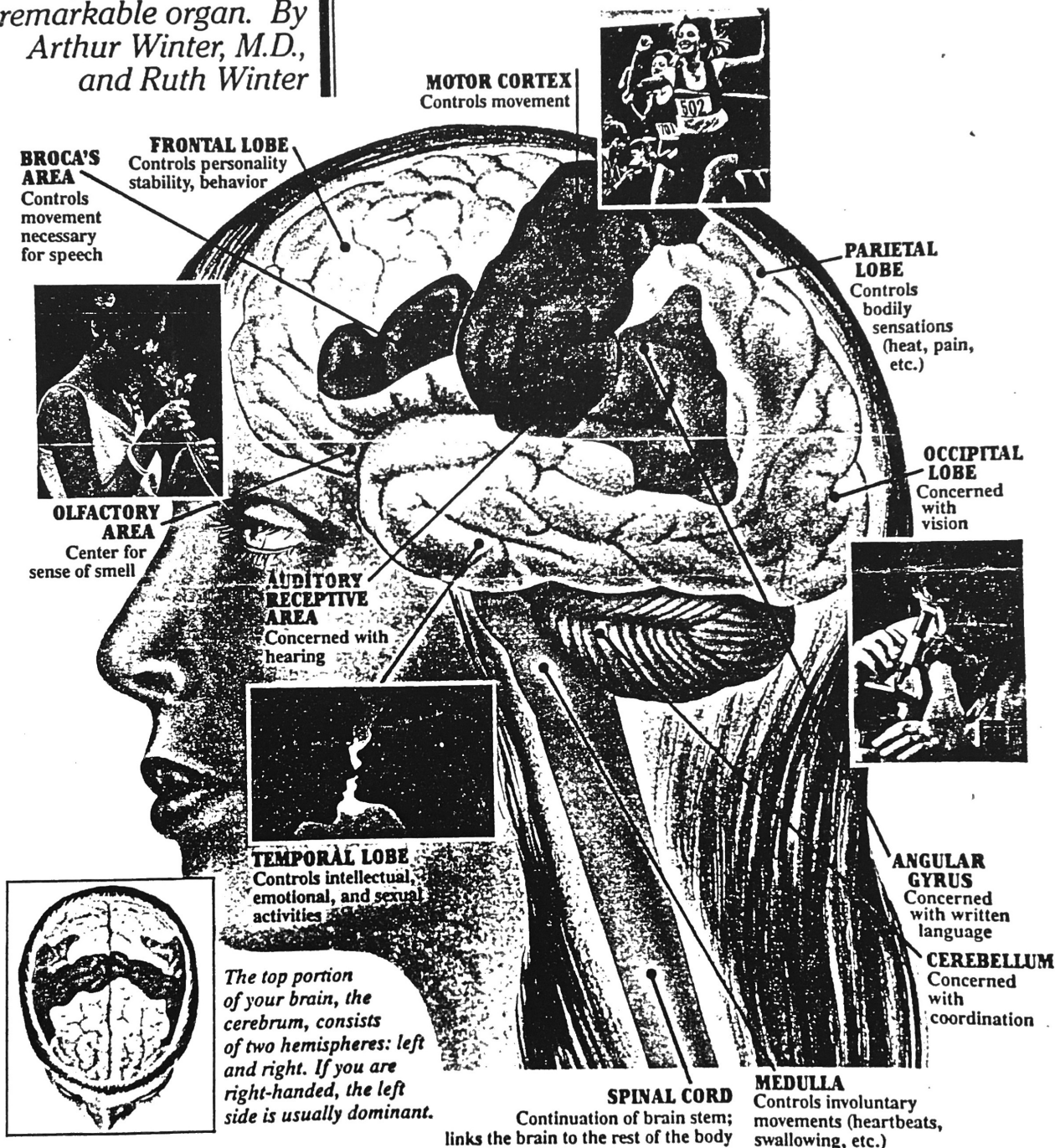


Things you never knew—all truly astonishing—about your body's most remarkable organ. By Arthur Winter, M.D., and Ruth Winter

# 26 FASCINATING



Every day we are learning more and more about the brain. We have learned that this incredible organ manufactures its own chemicals, that it can repair itself, and that it keeps on learning, even into old age. Using new equipment, doctors have filled in details on the "map"

of the brain, pinpointing centers of our conscious and unconscious activities. (The illustrations above show the main divisions, with a brief description of some of their functions.) Here are the latest findings, 26 fascinating facts about your brain:

**1 Brain Size Does Not Determine Intelligence.** It is not the size of the human brain but the number and complexity of projections from each of its nerve cells that determine intelligence. These twiglike projections, called dendrites, form pathways that connect with other

Illustrated by Judith Glick, photographs from The Image Bank

# FACTS ABOUT YOUR BRAIN

nerve cells, allowing the brain to receive and use the information that makes us smart.

**2 “Rockabye” Is Good for Baby’s Brain.** Rocking affects the cerebellum, the area of the brain that is involved in coordination. Infants whose brains are stimulated by periodic gentle rocking reportedly gain weight faster, develop vision and hearing acuity earlier, and have regular sleep cycles at a younger age.

**3 The Brain Is Lazy.** It has been estimated that the brain uses less than 10 percent of its potential. People have functioned quite well with half a brain when the other half was lost through illness or injury. (A college student in Great Britain was reported to have an IQ of 126 despite the fact that X rays showed the student had been born with only a fraction of the average brain.) How can we train our brains to use more power? Through education and repetition.

**4 The Brain Is a Good Secretary.** The brain is made up of different types of cells. One type, *neuroglial* cells (glial comes from the Greek, meaning “glue”), give physical and nutritional support to nerve cells (neurons) and also keep the neurons separated so that the messages from one neuron do not interfere with the messages of another. Interestingly, Dr. Marian Diamond of the University of California at Berkeley found that a specimen from the brain of Albert Einstein had 73 percent more neuroglial cells than the average brain, suggesting that the brilliant scientist had an extraordinary ability to distinguish thoughts and facts.

**5 The Brain Is a Good Housekeeper.** In addition to keeping order in the brain, neuroglial cells rid the brain of neurons killed by old age, disease, or injury. The dead neurons are engulfed and digested by neuroglial cells, making the brain self-cleaning.

**6 The Brain Makes Its Own Drugs.** The brain is a chemical factory that produces at least 50 psychoactive drugs. These drugs affect our intelligence, memory, and mood. The most familiar drugs in this group are the *endorphins* (which means “morphine from within”). Recent experiments have shown that our brains secrete more endorphins during periods of strenuous exercise, which accounts for the feeling of relaxation and well being—sometimes called a “runner’s high”—athletes experience after a period of working out.

**7 The Brain Helps You Stay Healthy.** According to current research at the National Institutes of Health, the brain’s self-made tranquilizers, the endorphins, are released into the blood. There they

*In less than a second your brain can recall a face it hasn’t seen in years—even if the face has aged considerably*

attract a type of white blood cells called macrophages, which are important in helping our bodies heal wounds. Other research has shown an additional connection between the brain and health: When the limbic system, the area of the brain that controls our emotions, is damaged, the body’s immune defenses are weakened.

**8 Stress Ages the Brain.** Stress has been cited as a cause of some 100 chemical and physical changes, including premature aging of the brain. Researchers at the National Institute on Aging have shown that brain deterioration in many older people is similar to that in younger people with Cushing’s Syndrome—a rapid premature form of aging associated with high levels of cortisol. (Cortisol is a hormone produced by the body under conditions of stress.) The brains of individuals subjected to extreme stress,

such as torture victims, have been found to have the same deterioration that is seen in the brains of older persons.

**9 The Brain Is a Computer.** The brain not only has its own set of instructions for virtually every movement your body makes, it also has its own code—or computerlike programs—for remembering how to perform each movement. That is why you never forget how to ride a bicycle. Healthy people can expand these programs by exercise and repetition (which is how you improve at sports), but brain-injured patients can also improve, according to studies at the University of Massachusetts and Emory University. Motion was successfully restored in brain-injured persons with paralyzed limbs by sending electrical signals to the injured brain. These signals mimic those for movement normally coded in the healthy brain.

**10 Music Goes to Your Brain.** Adults can lower blood pressure, sweating, and respiration rates by listening to calming music. In other studies, music was shown to have a stimulating effect on an unborn baby. When music was played through headphones that were placed on a pregnant woman’s abdomen, the baby’s movements and breathing both increased, ultrasound scans showed.

**11 The Brain Makes Do-It-Yourself Repairs.** Experts used to believe that once the brain was severely injured, it was irreparable. Today, research and therapy programs show that a great deal of lost brain function may be restored—either by nerves forming new connections by making slight detours or by nerves shunting signals around injured tissue areas, creating new pathways. New rehabilitation centers, such as those at New York University and The University of Medicine and Dentistry in New Jersey, have been able to take

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severely brain-injured patients and improve their ability to think, even years after they suffered brain trauma.

**12. You Have to Remind the Brain to Remember.** Short-term memory is a handy way to recall information you need to use right away. For example, short-term memory enables you to remember the telephone number you just looked up in the directory. (After you look it up, you remind the brain to remember it by repeating the number to your brain until you have dialed the number.) Once you make your phone call, your brain will probably forget the number because you are no longer reminding the brain what the number is. It is estimated that a brain can remember about five to ten different items at one time by using short-term memory.

**13. ... But Sometimes the Brain Already Knows.** This is long-term memory. It is a means for storing an almost endless amount of information for use minutes, days, or even years later. While it may take as long as 10 minutes to put something we have learned from short-term memory into long-term memory (like the telephone number), once it is there we can recall that information from long-term memory in less than a second. Long-term memory also enables us to recognize a face, even if it has aged since you last saw it, or an object, even one partially hidden by shadows.

**14. The Brain Is Awake When You Are Asleep.** About 90 minutes after you fall asleep, your brain activity intensifies for a 30-minute period or so. During these periods of increased brain activity, which occur about four or five times during a night's sleep, your heart rate, blood flow to the brain, respiration rate, and brain temperature all increase. Also, your eyes move rapidly beneath closed eyelids, giving these periods the name Rapid Eye Movement (REM) sleep.

**15. The Brain Is an Alarm Clock.** Not only does the brain control how you sleep, it also controls how easily you wake up. Under normal conditions, there is a good balance between your brain's sleep system and its arousal system, but the system can be upset. One symptom of a defect in the system is insomnia. (However, insomnia is more likely to be triggered by an emotional problem or stress or by such environmental factors as noise.)

**16. Caffeine Affects the Brain.** Caffeine acts as a stimulant, affecting portions of both the cerebrum, the center of such "higher" functions as speech, memory, and intelligence, and the brain stem, which merges into the spinal cord and is responsible for the body's vital functions, such as breathing and blood circulation. High doses of caffeine can produce nervousness, nausea, rapid heartbeat, restlessness, and insomnia.

**17. Exercise Can Make the Brain Smarter.** Investigators at New Mexico State University reported that a group of volunteers performed better on problem-solving tests following a period of strenuous exercise than they did without the exercise period. Brain-monitoring devices also showed that the well-exercised volunteers increased their analytical-thinking activity after their workouts.

**18. Old Brains Can Learn New Tricks.** Researchers at the National Institutes of Health's Baltimore Gerontology Research Center have shown that the brain of an elderly person can still learn if the person is given intellectual pursuits that preserve and enhance brain function. One group in this study (made up of individuals aged 65 and over), whose work required a sharp intellect, showed little or no weakening of their ability to learn. However, another group of the same age, who did not have to carry out such intellectually challenging work, showed a decline in learning ability.

**19. Your Brain Can Tell Your Body How to Run Itself.** Although the Yogis of India have long known it, Western scientists are just now recognizing that we can control some so-called "involuntary" body functions, such as heart rate, digestion, and circulation. One method of learning such control—biofeedback—is now used to treat many conditions, including high blood pressure, epilepsy, stroke, and learning disorders.

**20. The Brain Feels No Pain.** The brain can be burned, frozen, or cut without your feeling any pain. In fact, neurosurgeons sometimes operate on fully awake patients. The pain you feel during a headache is from blood vessels, usually arteries, that lie over and outside the brain. The brain does, however, receive pain information from other parts of your body, as when you stub your toe or burn your finger.

**21. The Brain Is Always Hungry.** Even though the brain accounts for only one-fiftieth of the body's total

weight, it requires *one-fifth* of the body's supply of oxygen and blood. Every 60 seconds more than 1½ pints of blood flow through the brain, supplying nutrients and oxygen.

**22. The Brain Has a Favorite Food.** It's glucose, a form of sugar derived from the food you eat. However, the brain, unlike other parts of the body, cannot store glucose; when it doesn't have enough, it sends out such distress signals as faintness, anxiety, and sweating.

**23. You Can Spy on the Brain.** Modern technology has made it possible to watch the brain at work. Brain Electrical Activity Mapping (BEAM) is a computerized technique used by doctors to measure brain activity; BEAM is very useful in evaluating children with learning disabilities and adult stroke victims. Another device, the Positron Emission Transaxial Tomography, or PET, scan shows which areas of the brain are active when a person is engaged in a particular activity, such as listening to music or solving a math problem. PET scans are often used by researchers to study differences in brain activity among persons of different ages, professions, and intellectual abilities.

**24. The Brain Does Not Always Pay Attention.** The brain receives and acts upon information provided by the five sense organs: eyes, nose, ears, tongue, and skin. If the brain keeps receiving the same message from these organs, it becomes bored and "turns off." That's why we stop noticing a wall decoration, for example, no matter how striking it seemed at first. Similarly, eating the same meal day after day becomes unappetizing.

**25. The Brain Floats.** Even though the average adult brain is soft and pliable—about the consistency of oatmeal—it weighs about three pounds. This would be a very heavy load for your neck to carry; fortunately, it doesn't have to because the brain floats in cerebrospinal fluid. This fluid protects the brain from shock and injury.

**26. Alcohol Can Kill a Brain.** Alcohol has a toxic and anesthetic action on nerve cells, and long-continued use of the drug can produce permanent damage to the brain. Large doses of alcohol cause acute intoxication and can result in coma and death. ★

*Arthur Winter, M.D., and Ruth Winter are the authors of Build Your Brain Power.*