SPLIT B & FREE

by Dietrick E.

The question whether human beings possess free will has been debated down through the millenia by philosophers, theologians, scientists and just plain folks. The argument persists when we ask not about the questions of the cosmos and eternity that exercise theologians and philosophers but about such questions as eating cherry pie rather than apple or voting for the Christian Democrats rather than the Communists. A school of psychology epitomized by B. F. Skinner takes the view that all things are materially determined, and that will doesn't exist. Most present-day philosophy and science see the universe as deterministic.

Yet people are conscious, and they think. Can something—if it is a thing—as fleeting as thought affect matter? Can free will affect physiology? Is there a place where it interacts with the body? Many 19th-century scientists derided the belief in a human soul because they could find neither an anatomical locus nor a physiological function for it. Modern psychology seems to be doing the same for free will.

Nevertheless people have an interior consciousness of a certain freedom of choice. "I have indubitable experience that by wishing and thinking I can affect my actions," says John Eccles, Distinguished Professor of Physiology and Biophysics at the Medical School of the State University of New York at Buffalo. This might be called the ontological proof of free will: It exists because we can imagine and experience its existence.

But the materialists still ask: How can there be free will in a deterministic universe? Eccles, quoting Karl Popper, calls the question a "nightmare." Yet there is experimental evidence bearing on the question of how mind, in the sense of consciousness and dispositional intentions, can affect the world of physical objects and physiological processes. Eccles chose to review it for the interdisciplinary *Orbis Scientiae* conference at the University of Miami in January, hoping especially that he might interest some of the physicists present in the physical aspects of the problem. The work is in a somewhat tentative state. Says Eccles: "I can give no scientific account of how thinking affects action. We're getting on with the job but still have far to go."

First we must admit that 98 percent of our actions are not free-willed but automatic, and that is a boon to us. If we had to think about our heartbeat or even about the actions involved in walking, we would hardly have time for any other mental activity. Yet by taking thought we can alter some of the automatic activity. We can change the rhythm of our breathing or the direction of our walking. It is at this level that the search for the way mind affects neurophysiology begins.

Let us start with a simple willed movement, the lifting of a finger. We know that prior to the muscular activity that does the lifting, certain cells in the brain, the parametal cells in the motor cortex, fire. Their firing triggers a chain of firing that we know how to follow down the neural pathways to the appropriate muscles. But the question that involves the will, says Eccles, is: "What goes on before the parametal cells fire?" He qualifies it as "a tricky problem."

Yet it has been attacked in experiments. The subject lies down with electrodes attached to the appropriate places on his body. He is told to repeatedly lift a finger, consciously willing the action each time. An electric potential in the muscles that do the action triggers a computer to look back at the record of brain activity over the two seconds before the muscle potential is sensed.

From 0.8 seconds before the movement there is "something going on, and its going on all over the brain," says Eccles. Activity is recorded on both sides of the brain. "It works up to a crescendo and concentrates on the cells where the activity takes place."

"The problem is now more complex," says Eccles. It is now "how to trigger all cells, then guide home to the specific cells involved." We must look for the place where the brain is in contact with the conscious self. It helps somewhat to study people whose brains have been surgically split.

Human beings—and mammals generally—are double brained. The two halves of the brain parallel each other. As far as motor activities are concerned the left half of the brain controls the right side of the body; the right half controls the left side. There is not absolute equality: One half—in most people the left—dominates. To ensure

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Dietrick E. Thomsen

cooperation and unified control of the two halves, or the two brains if you will, there is an interconnecting tissue, the corpus callosum, that provides 200 million connecting fibers for cross communication. If the corpus callosum is surgically cut, the two halves of the brain are put out of communication.

Eccles hastens to point out that these operations are not in that class of psychosurgery ethically questioned because of doubts about whether the patients consented voluntarily. The brain-splitting operation is a last-resort therapy for a very severe kind of epilepsy in which the patient has severe seizures at high frequency, sometimes several a day. The operation is used when drugs fail. "These people come to us begging for help," says Eccles.

When a person's brain has been split, the left hand literally does not know what the right is doing. Or perhaps the statement should be oppositely worded since it turns out that it is the right hand that really "knows."

The left hand is great at copying things; it is a kind of automatic writer. If a design is presented to the person's visual field in such a way that it registers only in the right half of the brain, the left hand will copy it automatically. Unless he watches his left hand, the person has no consciousness of what it is doing. If the design is presented to the left side of the brain, the right hand, acting like a rationally controlled artist, will start to sketch. If the right side of the brain is made privy to this activity, the left hand will get annoyed at the right hand's tentativeness and come over and try to help.

Generally the right side of the brain is more emotional and "primitive" than the left. Split-brained people are out of volitional contact and control of their left sides. This can produce bizarre experiences. There is a case on record where a man's right brain took a severe dislike to his wife. His left hand was continually making obscene gestures at her and once tried to strangle her. Only by using his right hand to break the grip of his left could the man prevent an unfortunate result. (It is thus not an easy condition to live with, but then neither is high-frequency *grand-mal* epilepsy. Those of us who have had neither are perhaps not in a position to judge which is better.)

In many cases the right side of the brain shows decidedly nasty character traits, and some observers have hypothesized that this is connected with frustration at its speechlessness. For speechless the right brain is. Man is the only animal whose brain possesses speech areas, and these are definitely on the left, says Eccles. This is true even in those left-handed persons who tend to be right-brained in other things. It is the left brain that talks.

Speech is infinitely closely related to rationality. It is in words that we reason and discuss; it is in words that we think deductively whether aloud or *sotto voce*. Adding up the evidence it seems that it is the left brain that is in contact with the conscious self. Here is the home of rational speech and volitional control. But we still have the question of how and at what stage of the physiological action rationality and will crowbar themselves into this world of snapping and firing neurons.

One suggestion has been that it is in the elementary units in the synaptic operation of the neurons. The renowned British physicist Sir Arthur Eddington once suggested that the uncertainty principle might give room for will. The uncertainty principle lies at the basis of quantum mechanics, the only nondeterministic physical theory we have. In quantum mechanics, which rules the world of atoms and subatomic particles, a given set of initial conditions does not lead to one and only one result as it does in other areas of physics. In atomic and subatomic physics a given process can lead to several results, and the theory can only give a statistical prediction of the probability of a particular result in any one instance.

Here, thought Eddington, was an opening for free will. But the uncertainty principle carries within itself a limitation on the sizes of the objects and areas over which it operates. The basic elements in the synaptic activity of neurons are too large to come under its umbrella. "I don't think it will do," says Eccles.

Other suggestions are that pure chance operates or that processes are controlled by something beyond physics.

"This is probably as far as I should take you," says Eccles. "I present it to the physicists now, hoping that they can devise concepts. We have a long, long way to go." □