

Is Thought Free? A Reply

SOMEONE DROPS A HEAVY BRICK on Charley's foot and we see him grimace, gasp, screech, clutch his foot, and jump up and down. Charley is feeling pain. As onlookers we know only the external physical manifestations presented by Charley. Charley alone is aware of the sharp, unpleasant inner sensation that is the essential feature of feeling pain. The inner perception of pain is but one of a group of mental phenomena that characterize the conscious human being. Other examples of such mental events are remembering, deliberating, expecting, desiring, and hearing. To say that perceiving pain and hearing a sound are mental events is not to deny their physical causation, but is to stress the inner awareness that we each have of what is going on in ourselves at the same time that we undergo physical processes. This inner awareness is the essence of consciousness, and involves what I will call "mental events."

In an editorial, "Is Thought Free?,"¹ Cohen, whose work I have admired for many years, states that "Since a major function of the brain is maintenance of consciousness, is it not likely that the decrease in brain oxygen consumption during anesthesia represents an absence of this vital process?" (i.e., consciousness). Cohen goes on to conclude that "thought is not free," apparently because the occurrence of mental events involves an expenditure of energy on which all thought is dependent. The explicit assumptions behind these conclusions are that consciousness is a function of cerebral energy utilization and that mental events are totally determined by physical processes. A further assumption that is implicit in such a position is that these dependent and determined mental phenomena cannot themselves cause changes in physical events.

This theory is known to philosophers as "epiphenomenalism." Briefly, this is the belief that there is a causal connection between physical events and mental events, but that the chain of causality is only one-way, in that physical changes are always the cause of mental events, but mental events do not cause physical changes. Our mental phenomena are the passive side-effects of a

chain of bodily occurrences. A major corollary of this theory of epiphenomenalism is that thought is not free, but is simply the offshoot of a physically determined causal sequence. When Charley's foot is hit by the brick, he winces and has a feeling of pain. The classic epiphenomenalist explains this by saying that the contact of the heavy brick with Charley's foot produces a series of events in the nerves that lead to his brain that result in the occurrence of a brain state which, in turn, causes the physical movement of wincing. Charley's mental side-effect of feeling pain is also caused by a brain state, for it is a byproduct of a chain of physical events, but, in itself, his feeling of pain has no effect on any part of the physical chain.²

The apparently scientific and reasonable epiphenomenalist theory that mental events in themselves have no causal efficacy leads to rather paradoxical conclusions. It would mean that thoughts, feelings and decisions have no physical consequences, and that even if we had always been unconscious, human history would have developed in the same physically determined way that it has. For if mental events are purely the byproducts of physical causes, their occurrence may be esthetically pleasing or displeasing, but they make no difference in fact. Men may continue to act with the range of behavior that is typical of consciousness, but their private and invisible mental events are mere "ghosts in the machine"³ that have no actual effects.

If Cohen wishes to maintain the causal efficacy of mental events and to continue to say such things as, "Charley screamed from the pain in his foot, so I anesthetized him," (i.e., that his mental event of pain *caused* Charley to scream so that a physical means of occluding the mental event had to be used), he must consider some means of explaining the relationship of mental events to physical occurrences other than epiphenomenalism. One way of doing this has been to claim that there really are no mental events distinct from the body, for all that exists is physical. This theory is contrary to epiphenomenalism in that it does not concede that mental events exist even as side-effects of physical proc-

esses. Instead, it contends that thoughts, feeling, wishes, and all so-called "mental" phenomena are *identical* to states of the body. When Charley screams from pain, he has certain bodily cells in certain states and nothing more. This theory is known as the "identity theory." Just as we talk of "lightning" as "a flash of yellow light in the sky" and know that it is identical to an electrical discharge, so the identity theorist postulates that we talk of "thoughts" and "feelings" and know that these are identical to electrical states. The events described by such terms as "lightning" and "thoughts" can be described in physical terms such as "electrical discharges" or "brain states."⁴

What sort of identity is intended between thoughts and brain states by this theory? For two things to be identical, they must exist at the same time and in the same location.⁵ Do mental events and brain states coexist in time and space?

Let us look at coexistence in time initially. During brain surgery the conscious patient reports the occurrence of mental events such as thoughts, sensations and memories, as the surgeon stimulates different parts of his brain. It is impossible to determine empirically whether the physical events in the brain and the mental events occur at exactly the same time. If there were even a slight time gap, all that would be proven would be that the mental event was not identical to just that physical event, not that it was not identical to any physical event. It seems technically difficult ever to determine whether mental events and brain states coexist in time.

Coexistence in space seems a more difficult problem for the identity theorist. At present we are able to say very little about the location of the relevant physical events, although as neurophysiology progresses, we may be able to say more. More telling, we seem unable to locate mental events. Suppose you have the sudden thought that philosophers deal with impractical abstractions. Where does that thought occur? It would seem strange to say that you feel it in your pancreas, your heart, or your head, because it makes no sense to locate the occurrence of your thought at some place within your body. It would seem equally strange to say that you are aware of the state of your brain when you report this sudden thought. A mental event just is not the sort of

thing whose physical location can be pinpointed. If we were able to see every event which occurred in the brain, we would never observe a thought. All that we can ever observe in the brain are the physical events which occur in it. Therefore, mental events cannot meet the condition necessary for identity with physical events of coexistence in space, and so cannot be identical to physical events. Thoughts, feelings, wishes, and the like are different sorts of things from physical events characterized by changes in size, shape, and location.

To say this is not to deny that when the anesthesiologist administers a drug to a patient he affects that patient's mental events by physical means, nor to deny that when the psychiatrist treats a psychosomatic illness he is trying to alter mental events which, in turn, affect the patient's physical well-being. It is only to say that mental phenomena, as we experience them in the ordinary course of consciousness, cannot be reduced to physical events as the identity theorist claims, or to byproducts of physical events as the epiphenomenalist claims.

Mental events in the anesthesiologist's own experience as he injects Charley with curare, observes Charley's physical signs during an operation, and grows anxious in the deterioration of Charley's vital signs, do occur to him as things which persist in time and undergo changes. Yet they are also invisible, intangible, and without size, shape, or mass. They are totally different in kind from physical states. When I have the intention to ride a bicycle, there is not some frantic ghostly inner thing pedalling to rehearse for the physical process. Mental processes are not pale imitations of physical processes. These mental events undeniably can be affected by states of the body, but states of the body can also be affected by states of consciousness. A feeling of terror may cause a person to turn white, tremble, or faint. As yet we cannot be more specific about the nature of the unique relation between thoughts and physical states. The reason for this is that while we can by experiment introduce an exclusively physical change and determine whether it has mental effects, we cannot introduce an exclusively mental change and see whether it has physical effects, for mental events in our experience do not occur in isolation from one

another or to disembodied persons. They are not the kind of thing that can be localized and manipulated for such experiments.

The anesthesiologist who is interested not only in how anesthesia works, but also in why it works, rightfully examines the effects of anesthetics on organic functions. But his scientific conclusions, which I do not claim any competence to challenge, must be tempered by the realization that they are concerned with only one aspect of the person, his physical body, and that there is a two-way relationship between that person's physical states and his mental events. Neither of these aspects of the person has been proven totally determinative of the other. If we wish to conclude that thought is not free because physical energy is needed for the production of mental events, then we must also conclude that the body is determined by the mind because it is causally affected by thoughts. Rather than settle for such a self-contradictory mutual determinism, we would

do better to acknowledge that neither the mind nor the body seems totally determined by the other. To conclude that thought is not free is to deny the very source of the curiosity and imagination that makes such a conclusion possible, human thought as it exists, reasons, and causes us to act.

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"Axoplasmic Transport"—The Catering and Communication System within Nerve Cells

WHAT IS axoplasmic transport—and what significance does this phenomenon have in clinical practice? Quite simply, the intracellular transport of organelles and macromolecules that occurs in the cytoplasm of all living cells is called "axoplasmic transport" (or more properly, "intra-axonal" transport) when it occurs inside the long processes—axons—of nerve cells. As in all cells, the purpose of this transport in nerve cell processes (nerve fibers) is to convey substances that have been manufactured by the cell's synthesizing machinery to areas of the cell in need of the synthesized molecules or organelles. Also, communication between the center of the cell and its peripheral parts is provided. The special form of transport that is of interest in this context is not passive diffusion, it is rapid (several hundred mm/day), requires energy, and probably is

linked to a specific organelle, the microtubule. This is a tubule 270 Å in diameter, made up of regularly arranged protein subunits—tubulin (fig. 1). Microtubules are found in all cells, and are concentrated in areas where motion or transport is most evident (e.g., the flagella of protozoa, the tail of the sperm, and the processes of melanocytes). No other organelle is as circumstantially connected with transport and motion as the microtubule. (For references to articles on microtubules in biologic systems, see reference 1.)

From the structure of a nerve cell it is evident that there must be a well-developed transport system inside. The cell body contains the machinery for synthesizing macromolecules and organelles. The nerve endings (which release the transmitter substance) are located at the other end of the often very long axon (nerve fiber) (see fig. 1B) and do not have the capacity (or have very little capacity) to produce the macromolecules they need to function properly. Therefore,

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