

The Will to Power

Neurosurgeons evoke an intention to act

BY CHRISTOF KOCH



SURELY THERE MUST have been times in high school or college when you laid in bed, late at night, and wondered where your “free will” came from? What part of the brain—if it is the brain—is responsible for deciding to act one way or another? One traditional answer is that this is not the job of the brain at all but rather of the soul. Hovering above the brain like Caspar the Ghost, the soul freely perturbs the networks of the brain, thereby triggering the neural activity that will ultimately lead to behavior.

Although such dualistic accounts are emotionally reassuring and intuitively satisfying, they break down as soon as one digs a bit deeper. How can this ghost, made out of some kind of metaphysical ectoplasm, influence brain matter without being detected? What sort of laws does Caspar follow? Science has abandoned strong dualistic explanations in favor of natural accounts that assign causes and responsibility to specific actors and mechanisms that can be further studied. And so it is with the notion of the will.

Sensation and Action

Over the past decade psychologists such as Daniel M. Wegner of Harvard University amassed experimental evidence for a number of conscious sensations that accompany any willful action. The two most important are intention and agency. Prior to voluntary behavior lies a conscious intention. When you decide to lift your hand, this intention is followed by planning of the detailed

What parts of the brain generate the feelings that arise within us whenever we take a decision?



movement and its execution. Subjectively, you experience a sensation of agency. You feel that you, not the person next to you, initiated this action and saw it through. If a friend were to take your hand and pull it above your head, you would feel your arm being dragged up, but you would not feel any sense of being responsible for it. The important insight here is that the consciously experienced feelings of intention and agency are no different, in principle, from any other consciously experienced sensations, such as the briny taste of chicken soup or the red color of a Ferrari.

And as a plethora of books on visual illusions illustrate, often our senses can be fooled—we see something that is not there. So it is with the sensation of intentionality and agency. Decades of psychology experiments—as well as careful observation of human nature that comes from a lifetime of living—reveal many in-

stances where we think we caused something to happen, although we bear no responsibility for it; the converse also occurs, where we did do something but feel that something or somebody else must have been responsible. Think about the CEO of a company who takes credit—and bonuses worth many millions—if the stock market price of his company rises but who blames anonymous market forces when it tanks. It is a general human failing to overestimate the import of our own actions when things go well for us.

Lest there be any misunderstanding: the sensations of the intention to act and of agency do not speak to the metaphysical debate about whether will is truly free and whether that even is a meaningful statement. Whether free will has some ontological reality or is entirely an illusion, as asserted forcefully by Wegner’s masterful monograph, does not invalidate the observation that voluntary

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(The consciously experienced feelings of intention and agency are **no different** from other feelings.)

actions are usually accompanied by subjective, ephemeral feelings that are nonetheless as real as anything else to the person who experiences them.

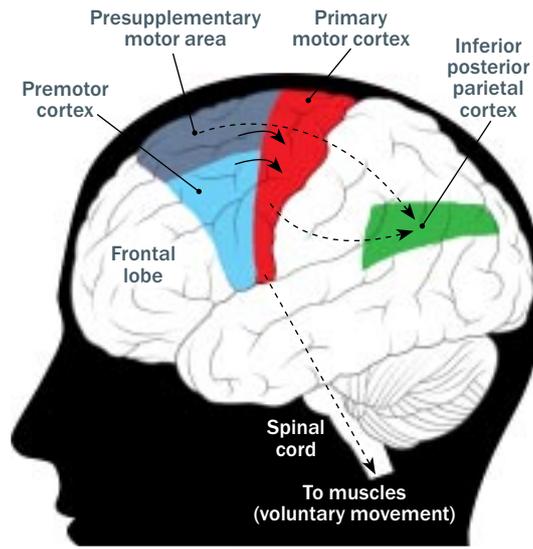
Telling Clues from Surgeries

The quiddity of these sensations has been strengthened considerably by neurosurgeons. During certain types of brain surgery, neural tissue must be removed, either because it is tumorous or because it gives rise to epileptic seizures. How much tissue to remove is a balancing act between the Scylla of leaving remnants of cancerous or seizure-prone material and the Charybdis of removing regions that are critical for speech or other near-essential operations. To probe the function of nearby tissue, the neurosurgeon stimulates it with an electrode that passes pulses of current while the patient—who is awake and under local anesthesia to minimize discomfort—is asked to touch each finger successively with the thumb, count backwards or do some other simple task.

During the course of such explorations in 1991, neurosurgeon Itzhak Fried of the University of California, Los Angeles, and his colleagues stimulated the presupplementary motor area, part of the vast expanse of cerebral cortex that lies in front of the primary motor cortex. Activation of different parts of the motor cortex usually triggers movements in different parts on the opposite side of the body, for example, the foot, leg, knee, hip, and so on. The medical team discovered that electrical stimulation of this adjacent region of cortex can, on occasion, give rise to an urge to move a limb. The patient reports that he or she feels a need to move the leg, elbow or arm.

This classical account was elaborated on by a recent study from Michel Desmurget and his colleagues from the Centre de Neuroscience Cognitive in Bron, France,

that was published in the international journal *Science*. Here it was electrical stimulation of the posterior parietal cortex, gray matter involved in the transformation of visual information into motor commands—as when your eyes scan the scene in front of you and come to rest on the movie marquee—that could produce



Brain areas involved in the feelings associated with voluntary action include premotor and parietal cortices.

pure intentions to act. Patients made comments (in French) such as “It felt like I wanted to move my foot. Not sure how to explain,” “I had a desire to move my right hand,” or “I had a desire to roll my tongue in my mouth.” In none of these cases did they actually carry out the movement to which they referred. But the external stimulation caused an unambiguous conscious feeling of wanting to move. And this feeling arose from within, without

any prompting by the examiner and not during sham stimulation.

This was different from the cortical sector explored by the earlier Fried study. One difference between the two stimulated regions was that, at higher current levels, the patient actually moved the limb when the target site was the presupplementary motor area. Parietal stimulation, on the other hand, could trigger a sensation that actual movement had occurred, yet without any motion actually occurring (illusion of movement).

The take-home lesson is that the brain has specific cortical circuits that, when triggered, are associated with sensations that arise in the course of wanting to initiate and then carry out a voluntary action. Once these circuits are delimited and their molecular and synaptic signatures identified, they constitute the neuronal correlates of consciousness for intention and agency. If these circuits are destroyed by a stroke or some other calamity, the patient might act without feeling that it is she who is willing the acting!

In the debate concerning the meaning of personal freedom, these discoveries represent true progress, beyond the eternal metaphysical question of free will that will never be answered. **M**

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(Further Reading)

- ◆ **Functional Organization of Human Supplementary Motor Cortex Studied by Electrical Stimulation.** Itzhak Fried, Amiram Katz, Gregory McCarthy, Kimberlee J. Sass, Peter Williamson, Susan S. Spencer and Dennis D. Spencer in *Journal of Neuroscience*, Vol. 11, pages 3656–2666; 1991.
- ◆ **The Illusion of Conscious Will.** Daniel Wegner. MIT Press, 2003.
- ◆ **Movement Intention after Parietal Cortex Stimulations in Humans.** Michel Desmurget, Karen T. Reilly, Nathalie Richard, Alexandru Szathmari, Carmine Mottolose and Angela Sirigu in *Science*, Vol. 324, pages 811–813; 2009.