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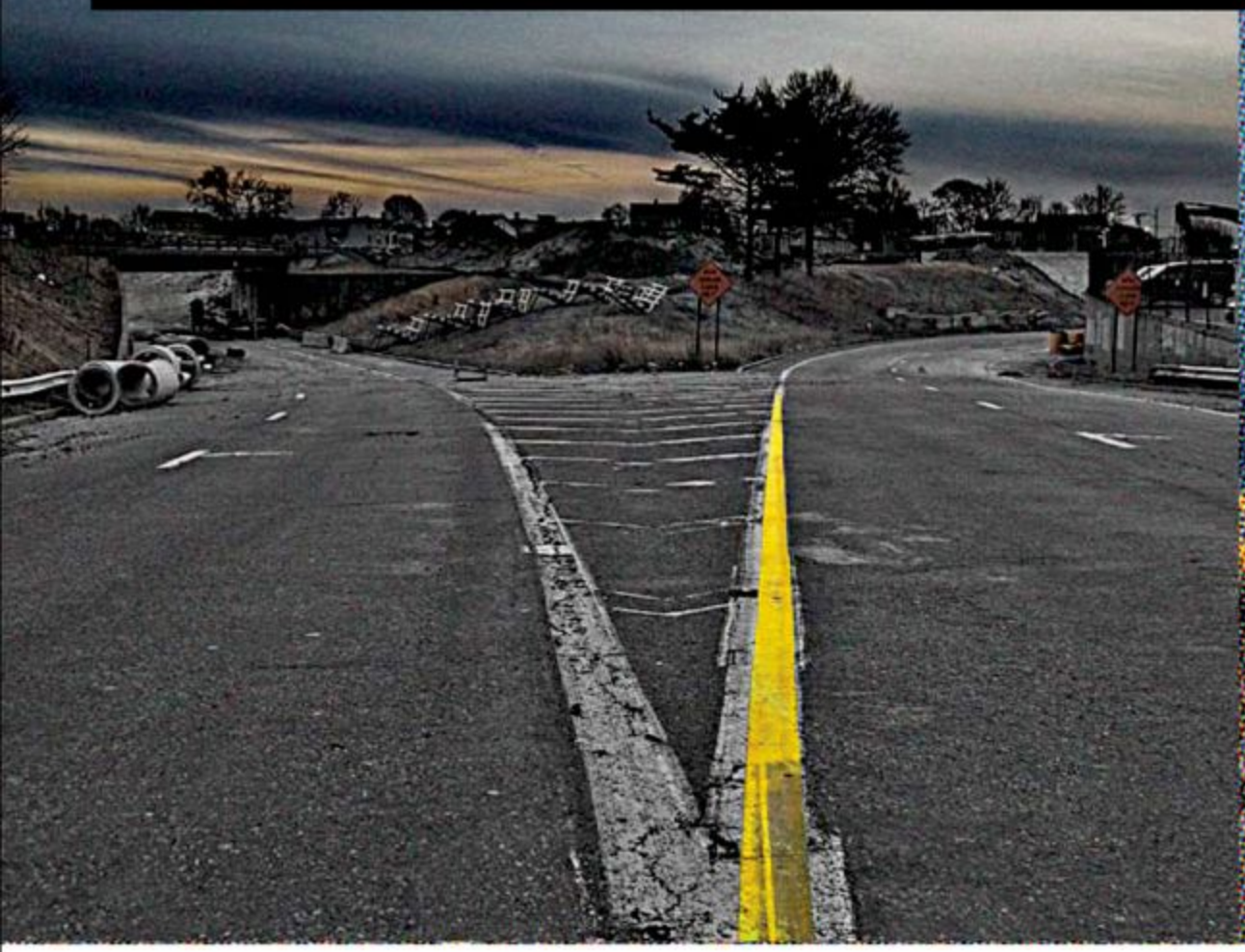

CONSCIOUS WILL AND RESPONSIBILITY

EDITED BY
Walter Sinnott-Armstrong
Lynn Nadel

OXFORD

Conscious Will and Responsibility

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PREFACE

The work of Benjamin Libet on the consciousness of intentions has implications for psychologists, philosophers, neuroscientists, and lawyers. When Walter Sinnott-Armstrong suggested the notion of holding a workshop in Libet's honor that would bring an interdisciplinary group of scholars together to consider these implications, I quickly agreed. We decided right away to hold the meeting in Tucson, and the idea emerged to connect it to the Tucson Consciousness meeting—a natural link.

We are grateful to the organizers of the Consciousness meeting, in particular Uriah Kriegel and Stuart Hameroff, for making this possibility a reality. The workshop was supported by the MacArthur Law and Neuroscience Program at UC Santa Barbara, and by a number of sources at the University of Arizona: the College of Law, the Eller College of Business and Public Administration, the College of Social and Behavioral Sciences, the Program in Cognitive Science, and the Office of the Vice President for Research. We thank these various contributors for their support. In addition, Catherine Carlin of Oxford University Press quickly saw the virtues of this workshop and provided both financial backing and a contract for this book. We thank her for this support, and for helping us initiate what we hope will be an exciting series of volumes at the interdisciplinary interface represented in this collection.

Lynn Nadel and Walter Sinnott-Armstrong

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Introduction

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Traditional philosophers often assume that the main challenge to moral and legal responsibility in general comes from determinism: If our choices and actions are determined, we cannot do otherwise, so we are not free, and then how could we be responsible? In reply to this challenge, compatibilists claim that we can have it all: complete and universal determinism as well as total freedom and responsibility.[1] According to common versions of compatibilism, responsibility does not require freedom from causation. Instead, responsibility and freedom require only that agents be responsive to reasons for and against their actions and/or that agents act on desires that fit with their values or second-order desires. Understood in these ways, freedom and responsibility are compatible with determinism. Moreover, modern legal systems nowhere explicitly mention determinism or presuppose that people and their acts are not caused or determined or that they have free will of any kind that excludes determinism.[2] Courts do not and need not settle the issue of determinism before they put criminals in jail. That's lucky, because it is doubtful that courts could settle that perennial issue, especially within the temporal and evidential limits of trials. Of course, some moral philosophers and legal scholars still argue that determinism does or would undermine moral and legal responsibility,[3] but many contemporaries think that they know at least roughly how to answer this traditional challenge to moral and legal responsibility.

Even if so, a separate challenge still needs to be met. Unlike the old issue of determinism, this new challenge concerns not whether anything causes our wills but, instead, whether our wills cause anything. This question is about the effects rather than the causes of our wills. It does not ask whether our wills are free but, rather, whether our wills are efficacious. The answer affects whether or how we can control what we do (that is, our actions) instead of whether we control what we choose to do (that is, our wills).

If our wills lack the power to cause the willed actions, this impotence is supposed to raise doubts about whether we are morally or legally responsible for those actions. These doubts arise from the assumption that causation by will or conscious will is necessary for complete moral or legal responsibility. This requirement seems enshrined in the voluntary act requirement, which is present in almost all modern systems of criminal law. For example, the Model Penal Code Section 2.01 says, "a bodily movement that otherwise is not a product of the effort or determination of the actor, either conscious or habitual" is not a voluntary act and, hence, cannot alone be the basis for criminal liability or guilt. If "a product of" means "caused by," and "effort or determination" means "will," then non-habitual actions cannot alone be the basis for legal guilt under this voluntary act requirement unless they are caused by conscious will.

The fact that this legal requirement is so widespread suggests that it is based on common sense. This suggestion receives additional support from moral intuitions. Consider normal reflective actions. When I choose to bet rather than fold in a poker game, I normally go through

a conscious process of deliberation and then consciously choose to bet or fold by moving my mouth and hands in a certain way and at a certain time rather than earlier or later. Acts that result from such conscious processes are seen as paradigms of acts for which agents are responsible. That seems to be why people are required to pay their poker debts, at least normally.

In contrast, when a person with Tourette's syndrome yells or moves his or her body as a result of brain mechanisms that do not involve such conscious processes, then we do not and should not hold that person responsible for the act. Just imagine a person with Tourette's syndrome playing poker and yelling "all in." Even if the person was thinking about moving all in (that is, betting all of his chips), and even if he had decided to do so and was just waiting for the right moment, if this particular act of saying "all in" was a result of the Tourette's syndrome and not a result of the conscious will to make that bet, then we would and should not hold him responsible for making the bet.

Similarly, people with alien hand syndrome also would and should not be held responsible for what their alien hand does, when that bodily movement was not produced by any conscious choice. If a poker player with alien hand syndrome moves her chips into the pot and then tells us that what pushed the chips was her alien hand and not what she really chose to do, then (if we believe her) we would and should let her take back the chips, even though people are not normally allowed to take back such bets. People with Tourette's or alien hand syndrome might be held responsible for not avoiding situations where their neural maladies would be misinterpreted or cause harm, but they are not and should not usually be held responsible for the acts themselves.

What removes or reduces responsibility in such cases seems to be the fact that the agent's conscious will does not cause these bodily movements. Other interpretations are possible, of course, but cases like these suggest to many people that we cannot be responsible for actions unless those actions are caused by a conscious will.

A problem arises when people deny that conscious will causes action in normal people. If responsibility requires causation by conscious will, but conscious will never causes actions, then even normal agents are never responsible for their actions. The critical question, then, is whether we should deny that conscious will causes action in normal people.

Some philosophers deny that any mental event or state can cause any bodily movement, such as an action. One form of this problem arises from *dualism*, which is the view that mind and body are distinct and separable substances.[4] Most dualists, including Descartes, held that body affects mind and mind affects body. This view was labeled *interactionism*. Critics argued, however, that mind and body differ so much in their natures that we cannot make sense of causal relations between mind and body. How can changes in a substance without any spatial properties, such as mind, cause or be caused by changes in a substance with spatial properties, such as body? These critics were led to strange positions like *parallelism* (the view that neither mind nor body causes changes in the other, although they change in parallel because of a preestablished harmony that God created), *occasionalism* (the view that, on those occasions when humans will physical motions, God detects the will and causes the movement),[5] and *epiphenomenalism* (the view that physical events cause mental events but mental events never cause physical events).[6] These views are general theories that apply as much to pain and perception as to will. Still, the last three views—parallelism, occasionalism, and epiphenomenalism—all imply that conscious wills, which are a kind of mental event, never cause bodily movements, which are a type of physical event.

Although these old positions all assume dualism, some materialists or physicalists in the nineteenth century adopted a variation on epiphenomenalism. Even if a mental event is always also a physical event, it is still a special kind of physical event. Some physical events or states (such as some brain states) are also mental events, whereas other physical events or states (such as rain states) are not mental. Indeed, many brain events, such as blood flow in the brain stem, seem to have no mental properties at all. Thus, even physicalists can hold that changes

in physical properties can cause changes in mental properties, but changes in mental properties cannot ever cause changes in physical properties. This position amounts to a physicalist version of epiphenomenalism.

Since epiphenomenalism (whether dualist or physicalist) is about all mental events and states, it does not apply only to will. Other philosophers, in contrast, restrict their claim to the particular mental event of willing. They deny that willing to move ever causes any bodily movement. Nietzsche, for example, says, "The 'inner world' is full of phantoms and will-o'-the-wisps: the will is one of them. The will no longer moves anything, hence does not explain anything either—it merely accompanies events; it can also be absent."[7] This claim applies not only to conscious will but to all will.

This broad claim is hard to evaluate scientifically, because it applies to unconscious wills, and unconscious wills are hard to detect. A person who has an unconscious will cannot detect it, because it is unconscious. Observers (such as scientists) also cannot detect it without reports or some telling effect. Moreover, many theorists hold that wills, choices, intentions, and related mental events or states are necessarily conscious, so the notion of an unconscious will is an oxymoron. For such reasons, most scientists and philosophers have focused on conscious will in this debate.

This new challenge is still not about consciousness in general. Even if consciousness does have some kinds of effects, such as through perception, that does not show that conscious will causes action. The issue is also not about whether conscious will has any effects at all. Consciousness of willing an act might affect how much guilt an agent feels after doing that act, for example. Still, such later effects show only that conscious will can have side-effects, not that it has effects on the act that is willed. The real question, then, is whether conscious will causes that act that is willed.

A negative answer to this question can be reached through a general claim about consciousness, namely, that consciousness and conscious mental states or events never cause physical states or events. Thomas Huxley seems to have held something like this position.[8] It can be called epiphenomenalism about consciousness, and it implies epiphenomenalism about conscious will.

This position needs to be distinguished from the claim that unconscious forces affect our decisions and our lives. Building on predecessors, Sigmund Freud emphasized the role of unconscious mental states, especially unconscious desires. More recently, psychologists[9] have shown how choices that seem to be based on conscious reasons are affected by unconscious factors. A well-known example is that people named Ken are more likely than chance to move to Kentucky, people named Denis or Dennis are more likely than chance to become dentists, and so on. This suggests that unconscious connections influence choices. However, that claim is compatible with conscious reasons also having a lot of influence on choices. After all, choices might be influenced by both conscious and unconscious causes. Moreover, the claim that unconscious forces influence choices is about what causes the will rather than about what the will causes. Hence, this common claim is distinct from epiphenomenalism about consciousness or about conscious will.

Another body of evidence might seem to support the view that conscious wills never cause the willed actions. Some relevant experiments were performed by Benjamin Libet and others who used methods derived from Libet. Additional experiments, using different paradigms, were performed later by Dan Wegner and his followers. Most recently, John-Dylan Haynes has reported striking results that have led some commentators to endorse related views. Of course, more scientists have been involved in this tradition. Many of these experiments are described in various chapters in this volume, so there is no need to summarize them here. The point for now is just that these scientific findings are often seen as suggesting that conscious wills never cause the willed acts.

Although this challenge is usually presented universally about all acts, it could instead be restricted to a subset of actions. This restriction would not rob the thesis of interest if the acts that are not caused by conscious will are ones

whose agents seem responsible or where responsibility is controversial. Even if epiphenomenalism about conscious will holds only for some but not for all acts, this new challenge can still undermine common ascriptions of responsibility in special cases and, hence, can challenge common standards of responsibility.

Even if these challenges can be met, their value should be clear. Libet's experiments along with later research in the same tradition have raised new questions about common assumptions regarding action, freedom, and responsibility. Even if we retain those assumptions in the end, rethinking them can increase our confidence in them as well as our understanding of why they are true. Libet's work, thus, contributes a lot even to those who reject his claims. That is why the contributors all pay tribute to him in this collection.

The best tribute to any thinker is careful attention to his ideas, even when this attention leads to rejection. Libet's views include descriptive claims about the role of conscious will in action as well as philosophical and normative conclusions that are supposed to follow from his descriptive premises given additional normative assumptions.[10] Whether those claims, assumptions, and conclusions are defensible—and whether those conclusions follow from his premises or from later work in this tradition—are the issues addressed in the essays in this volume.

This volume opens with a classic essay in which Libet lays out his basic experimental results and draws philosophical lessons regarding free will and responsibility. This chapter raises the issues to be discussed in the rest of the volume.

One crucial issue concerns the interpretation of the readiness potential (RP). In Chapter 2, Roskies questions the relation between the RP and movement initiation as well as the importance of the timing of the initial rise of the RP. In Chapter 3, Mele argues that the RP is better seen as an urge that causes a decision than as a decision itself and also that the RP has not been shown to be sufficient for action. In Chapter 4, Pockett and Purdy then present new experimental evidence that the RP is not sufficient for action and begins significantly later than Libet suggested when subjects make decisions rather than merely act on urges. Pockett and Purdy conclude that movements resulting from conscious decisions are unlikely to be initiated preconsciously. They, along with Roskies, also raise the issue of whether and, if so, how the sorts of phenomena that Libet explores bear upon freedom and responsibility.

Another important problem for Libet's method concerns the meaning and reliability of his subjects' reports of the time when they became conscious of choosing or willing to move (W). In Chapter 5, Banks and Isham describe a new series of experiments suggesting that the moment of decision is not introspected but is, instead, inferred from the action. In line with Libet, Banks and Isham conclude that conscious will is not involved in the cause of the action. In Chapter 6, Mark Hallett describes an experiment designed to time the thought (T) of movement without relying on introspective data or retrospective reconstruction. Hallett's experiment found that T occurred later than observable brain events linked to action. His results also suggest that there is not enough time to veto action after willing becomes conscious, contrary to Libet's way of saving free will.

Some critics have charged that Libet conflates different mental states. In Chapter 7, Pacherie and Haggard distinguish immediate intentions from prospective intentions as well as what-decisions and how-decisions from when-decisions. They use their framework to clarify which mental states Libet's experiments were about. In Chapter 8, Haynes reports experiments using fMRI and pattern classifiers to explore less immediate intentions and choices than Libet studied. Haynes found signals from unconscious brain activity that predict, above chance, decisions 7–10 seconds in advance, and he was also able to separate the "what" from the "when" in a decision.

These results raise important questions about when and why our wills become conscious. The issue of consciousness is addressed in Chapter 9, where Carota, Desmurget, and Sirigu present evidence that the motor system is mainly aware of its intention but not of the details of the ongoing movements, as long as the goal is achieved. In Chapter 10, Graves, Maniscalco, and Lau

discuss evidence that complex actions can be performed without consciousness or can be directly influenced by unconscious information. They question whether the function of consciousness is to enable us to deliberate about our actions, and they suggest an experiment to demonstrate the true function of consciousness.

In Chapter 11, Talmi and Frith place these issues of consciousness in a larger context by reinterpreting Libet's results in light of a distinction between Type 1 and Type 2 mental processing. They use this framework to explain why we have a conscious experience of our own free will, and they discuss potential moral consequences of seeing apparent free will as an illusion. The sense of freedom is closely allied with a sense of agency, which is the topic of the next two chapters. In Chapter 12, Ebert and Wegner argue that we determine whether we are authors of actions through a variety of clues, including temporal proximity between thoughts, actions, and events. When authorship is inferred, we then bind the action and subsequent events together by perceiving the action and events as closer than they otherwise would seem to be. In Chapter 13, Wheatley and Looser cite cases where the feeling of will is imputed, manipulated, and taken away inappropriately and independent of action. These cases are supposed to show that our sense of will, intentionality, and agency is inferred retrospectively and might well be illusory.

In Chapter 14, Horgan argues that the work of Libet and others is fully compatible with the phenomenal character and content of the experience of initiating an act. In his view, conscious agentive experience is not illusory. In contrast, Nadelhoffer argues in Chapter 15 that recent advances in psychology and neuroscience have the potential to radically transform traditional views of human agency and free will.

The ultimate issue in these debates concerns moral and legal responsibility. In Chapter 16, Yaffe explains the meaning and explores the historical sources of the voluntary act requirement in law, and then he argues that Libet probably has not shown that our acts are not voluntary in the sense that is relevant to law. In Chapter 17, Alexander suggests that the gatekeeper role for conscious will, which Libet allows, does not require any revision of traditional notions of moral and criminal responsibility. In Chapter 18, Moore then distinguishes three challenges to responsibility and proposes a novel model of how conscious will causes bodily movement and, hence, of how we can be morally responsible for our voluntary actions. Finally, in Chapter 19, Sinnott-Armstrong argues that the empirical findings of Libet and his followers do not undermine moral or legal responsibility in general but do raise profound issues for some kinds of minimal action.

These all-too brief descriptions of the chapters do not do justice to their complexity, subtlety, and richness. To appreciate those qualities, the essays simply have to be read. Taken together, these essays show how fruitful and important Libet's research has been. Whether or not we agree with Libet's claims, he clearly sets the stage for a great deal of fascinating research and discussion.

NOTES

1. See http://plato.stanford.edu/entries/compatibilism/
2. See Stephen Morse, "The Non-problem of Free Will in Forensic Psychiatry and Psychology," *Behavioral Sciences and the Law* 25 (2007): 203–220.
3. See the chapters by van Inwagen, O'Connor, Clarke, Ginet, Kane, Strawson, and Pereboom in Kane, *Oxford Handbook of Free Will* (New York: Oxford University Press, 2001).
4. See http://plato.stanford.edu/entries/dualism/
5. See http://plato.stanford.edu/entries/occasionalism/
6. See http://plato.stanford.edu/entries/epiphenomenalism/
7. Friedrich Nietzsche, *Twilight of the Idols* in *The Portable Nietzsche*, translated and edited by Walter Kaufmann (New York: Viking, 1954), pp. 494–495.
8. T. H. Huxley,"On the Hypothesis That Animals Are Automata, and Its History," *The Fortnightly Review*, n.s. 16 (1874): 555–580. Reprinted in *Method and Results: Essays by Thomas H. Huxley* (New York: D. Appleton & Company, 1898). Huxley reported the case of Sergeant F., who was hit by a bullet around his parietal lobe and later sometimes exhibited complex behavior

(e.g., singing, writing a letter, "reloading," "aiming," and "firing" his cane with motions appropriate to a rifle) while he seemed unconscious (because he was not sensitive to pins and shocks, as well as sounds, smells, tastes, and much vision). This case is supposed to suggest the possibility that consciousness is not necessary for complex and purposeful movements, but it cannot show that conscious will is never necessary for any bodily movement in normal humans.

9. Such as those collected in R. R. Hassin, J. S. Uleman, and J. Bargh, *The New Unconscious* (New York; Oxford University Press, 2005).
10. This argument need not derive "ought" from "is" or commit any "naturalistic fallacy," because the science need not settle any normative issue without additional normative premises that also need to be defended.

CHAPTER 1

Do We Have Free Will?

Benjamin Libet

ABSTRACT

I have taken an experimental approach to this question. Freely voluntary acts are preceded by a specific electrical change in the brain (the "readiness potential," RP) that begins 550 ms before the act. Human subjects became aware of intention to act 350–400 ms ***after*** *RP starts, but 200 ms before the motor act. The volitional process is therefore* ***initiated*** *unconsciously. But the conscious function could still control the outcome; it can veto the act. Free will is therefore not excluded. These findings put constraints on views of how free will may operate; it would not initiate a voluntary act but it could* ***control*** *performance of the act. The findings also affect views of guilt and responsibility.*

But the deeper question still remains: Are freely voluntary acts subject to macrodeterministic laws or can they appear without such constraints, nondetermined by natural laws and "truly free?" I shall present an experimentalist view about these fundamental philosophical opposites.

The question of free will goes to the root of our views about human nature and how we relate to the universe and to natural laws. Are we completely defined by the deterministic nature of physical laws? Theologically imposed fateful destiny ironically produces a similar end-effect. In either case, we would be essentially sophisticated automatons, with our conscious feelings and intentions tacked on as epiphenomena with no causal power. Or, do we have some independence in making choices and actions, not completely determined by the known physical laws?

I have taken an experimental approach to at least some aspects of the question. The operational definition of free will in these experiments was in accord with common views. First, there should be no external control or cues to affect the occurrence or emergence of the voluntary act under study; i.e., it should be endogenous. Second, the subject should feel that he/she wanted to do it, on her/his own initiative, and feel he could control what is being done, when to do it or not to do it. Many actions lack this second attribute. For example, when the primary motor area of the cerebral cortex is stimulated, muscle contractions can be produced in certain sites in the body. However, the subject (a neurosurgical patient) reports that these actions were imposed by the stimulator, i.e., that he did not will these acts. And there are numerous clinical disorders in which a similar discrepancy between actions and will occurs.

These include the involuntary actions in cerebral palsy, Parkinsonism, Huntington's chorea, Tourette's syndrome, and even obsessive compulsions to act. A striking example is the "alien hand syndrome." Patients with a lesion in a fronto-medial portion of premotor area may find that the hand and arm on the affected side performs curious purposeful actions, such as undoing a buttoned shirt when the subject is trying to button it up; all this occurs without or even against the subject's intention and will (cf. Spence & Frith, 1999, p. 23).

TIMING OF BRAIN PROCESSES AND CONSCIOUS WILL

Performance of "self-paced" voluntary acts had, surprisingly, been found to be preceded by a slow electrical change recordable on the scalp at

the vertex (Kornhuber & Deecke, 1965). The onset of this electrical indication of certain brain activities preceded the actual movement by up to 1 s or more. It was termed the "Bereitschaftpotential" or "readiness potential" (RP). To obtain the RP required averaging the recordings in many self-paced acts. Subjects were therefore asked to perform their acts within time intervals of 30 s to make the total study manageable. In our experiments, however, we removed this constraint on freedom of action; subjects performed a simple flick or flexion of the wrist at any time they felt the urge or wish to do so. These voluntary acts were to be performed capriciously, free of any external limitations or restrictions (Libet, Wright, & Gleason, 1982). RPs in these acts began with onsets averaging 550 ms before activation of the involved muscle (Fig. 1.1).

The brain was evidently beginning the volitional process in this voluntary act well before the activation of the muscle that produced the movement. My question then became: *when* does the *conscious* wish or intention (to perform the act) appear? In the traditional view of conscious will and free will, one would expect conscious will to appear before, or at the onset of, the RP, and thus command the brain to perform the intended act. But an appearance of conscious will 550 ms or more before the act seemed intuitively unlikely. It was clearly important to establish the time of the conscious will relative to the onset of the brain process (RP); if conscious will were to *follow* the onset of RP, that would have a fundamental impact on how we could view free will.

To establish this temporal relation required a method for measuring the time of appearance of the conscious will in each such act. Initially, that seemed to me an impossible goal. But after some time it occurred to me to try having the subject report a "clock-time" at which he/she was *first aware* of the wish or urge to act (Fig. 1.2) (Libet, Gleason, Wright, & Pearl, 1983). The clock had to be much faster than the usual clock, in order to accommodate time differences in the hundreds of ms. For our clock, the spot of light of a cathode ray oscilloscope was made to revolve around the face of the scope like the sweep-second hand of an ordinary clock, but at a speed approximately 25 times as fast. Each of the marked off "seconds" around the periphery was thus equivalent to about 40 ms. When we tried out this method we were actually surprised to find that each subject reported times for *first awareness of wish to act* (W) with a reliability of 20 ms, for each group of 40 such trials. A test for the accuracy of such reports was also encouraging. In this, the subject remained relaxed and did *not* perform any voluntary act. Instead, a weak electrical stimulus was delivered to the skin of the same hand. The stimulus was applied at random times in the different trials.

The experimental observers knew the actual time for each stimulus. The subject did not know this actual time but was asked to report the clock-time at which he felt each such stimulus. Subjects accomplished this with an error of only −50 ms.

The Experiment

In the actual experiment, then, each RP was obtained from an averaged electrical recording in 40 trials. In each of these trials the subject performed the sudden flick of the wrist whenever he/she freely wanted to do so. After each of these trials, the subject reported W, the clock-time associated with the first awareness of the wish to move (Libet, Gleason, et al., 1983).

Brain Initiates Voluntary Act Unconsciously

The results of many such groups of trials are diagrammed in Figure 1.3. For groups in which all the voluntary acts were freely spontaneous, with no reports of rough preplanning of when to act, the onset of RP averaged −550 ms (before the muscle was activated). The W times for first awareness of wish to act averaged about −200 ms., for all groups.

This value was the same even when subjects reported having preplanned roughly when to act! If we correct W for the −50 ms error in the subjects' reports of timings of the skin stimuli, we have an average corrected W of about −150 ms. Clearly, the brain process (RP) to prepare for this voluntary act began about 400 ms. before the appearance of the conscious will to act (W). This relationship was true for every group of 40 trials and in every one of the nine subjects studied.

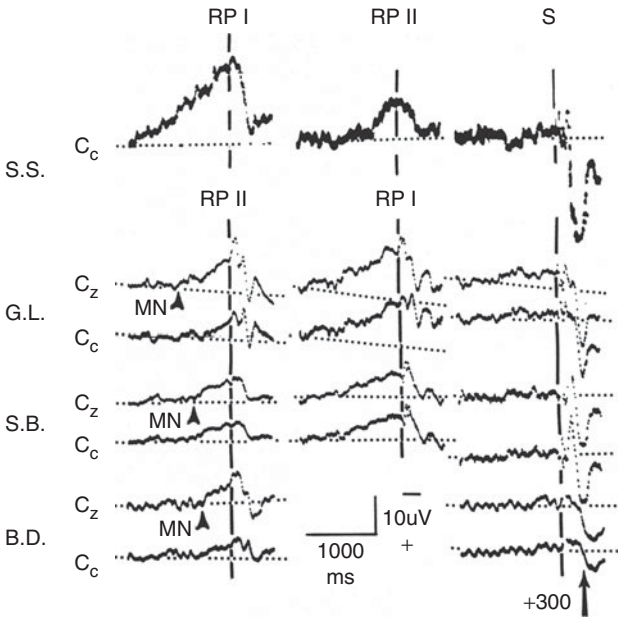

Figure 1.1 Readiness Potentials (RP) Preceding Self-Initiated Voluntary Acts. Each horizontal row is the computer-averaged potential for 40 trials, recorded by a DC system with an active electrode on the scalp, either at the midline-vertex (Cz) or on the left side (contralateral to the performing right hand) approximately over the motor/premotor cortical area that controls the hand (Cc). When every self-initiated quick flexion of the right hand (fingers or wrist) in the series of 40 trials was (reported as having been) subjectively experienced to originate spontaneously and with no preplanning by the subject, RPs labeled type II were found in association. (Arrowheads labeled MN indicate onset of the "main negative" phase of the vertex recorded type II RPs in this figure; see Libet et al., 1982.) Onsets were also measured for 90% of the total area of RP). When an awareness of a general intention or preplanning to act some time within the next second or so was reported to have occurred before some of the 40 acts in the series, type I RPs were recorded (Libet et al., 1982). In the last column, labeled S, a near-threshold skin stimulus was applied in each of the 40 trials at a randomized time unknown to the subject, with no motor act performed; the subject was asked to recall and report the time when he became aware of each stimulus in the same way he reported the time of awareness of wanting to move in the case of self-initiated motor acts. The solid vertical line through each column represents 0 time, at which the electromyogram (EMG) of the activated muscle begins in the case of RP series, or at which the stimulus was actually delivered in the case of S series. The dashed horizontal line represents the DC baseline drift. For subject S.S., the first RP (type I) was recorded before the instruction "to let the urge come on its own, spontaneously" was introduced; the second RP (type II) was obtained after giving this instruction in the same session as the first. For subjects G.L., S.B., and B.D., this instruction was given at the start of all sessions. Nevertheless, each of these subjects reported some experiences of loose preplanning in some of the 40-trial series; those series exhibited type I RPs rather than type II. Note that the slow negative shift in scalp potential that precedes EMGs of self-initiated acts (RP) does not precede the skin stimulus in S series. However, evoked potentials following the stimulus are seen regularly to exhibit a large positive component with a peak close to +300 ms (arrow indicates this time); this P300 event-related potential had been shown by others to be associated with decisions about uncertain events (in this case, the time of the randomly delivered stimulus), and it also indicates that the subject is attending well to the experimental conditions.

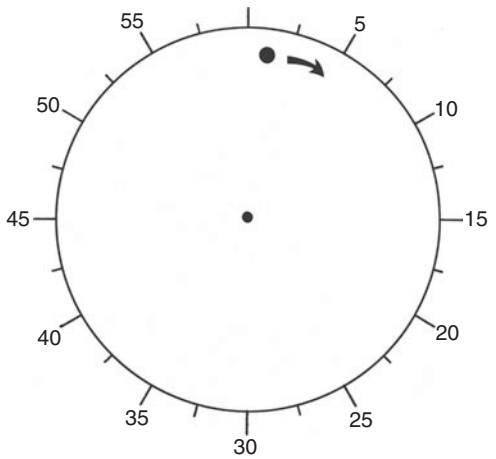

Figure 1.2 Oscilloscope "Clock." Spot of light revolves around periphery of screen, once in 2.56 s (instead of 60 s for a sweep-second hand of a regular clock). Each marked-off "second" (in the total of 60 markings) represents 43 ms of actual time here. The subject holds his gaze to the center of the screen. For each performed quick flexion of the wrist, at any freely chosen time, the subject was asked to note the position of the clock spot when he/she first became aware of the wish or intention to act. This associated clock time is reported by the subject later, after the trial is completed.

It should also be noted that the actual difference in times is probably greater than the 400 ms; the actual initiating process in the brain probably starts before our recorded RP, in an unknown area that then activates the supplementary motor area in the cerebral cortex. The supplementary motor area is located in the midline near the vertex and is thought to be the source of our recorded RP.

ANY ROLE FOR CONSCIOUS WILL?

The initiation of the freely voluntary act appears to begin in the brain unconsciously, well before the person consciously knows he wants to act! Is there, then, any role for conscious will in the performance of a voluntary act? (see Libet, 1985) To answer this it must be recognized that conscious will (W) does appear about 150 ms before the muscle is activated, even though it follows onset of the RP. An interval of 150 ms would allow enough time in which the conscious function might affect the final outcome of the volitional process. (Actually, only 100 ms is available for any such effect. The final 50 ms before the muscle is activated is the time for the primary motor cortex to

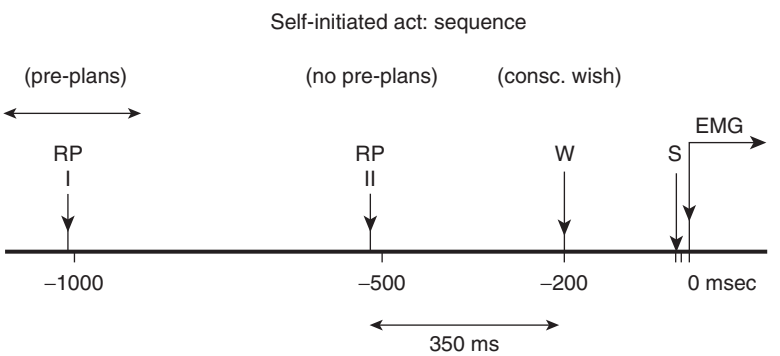

Figure 1.3 Diagram of Sequence of Events, Cerebral and Subjective, That Precede a Fully Self-Initiated Voluntary Act. Relative to 0 time, detected in the electromyogram (EMG) of the suddenly activated muscle, the readiness potential (RP, an indicator of related cerebral neuronal activities) begins first, at about −1050 ms when some preplanning is reported (type I RP) or about −550 ms with spontaneous acts lacking immediate preplanning (type II RP). Subjective awareness of the wish to move (W) appears at about −200 ms, some 350 ms after onset even of type II RP; however, W does appear well before the act (EMG). Subjective timings reported for awareness of the randomly delivered S (skin) stimulus average about −50 ms relative to actual delivery time. (From Libet, 1989.)

activate the spinal motor nerve cells. During this time the act goes to completion with no possibility of stopping it by the rest of the cerebral cortex.)

Potentially available to the conscious function is the possibility of stopping or vetoing the final progress of the volitional process, so that no actual muscle action ensues. *Conscious-will could thus affect the outcome* of the volitional process even though the latter was initiated by unconscious cerebral processes. Conscious-will might block or veto the process, so that no act occurs.

The existence of a veto possibility is not in doubt. The subjects in our experiments at times reported that a conscious wish or urge to act appeared but that they suppressed or vetoed that. In the absence of the muscle's electrical signal when being activated, there was no trigger to initiate the computer's recording of any RP that may have preceded the veto; thus, there were no *recorded* RPs with a vetoed intention to act. We were, however, able to show that subjects could veto an act planned for performance at a prearranged time. They were able to exert the veto within the interval of 100 to 200 ms before the preset time to act (Libet, Wright, & Gleason, 1983). A large RP preceded the veto, signifying that the subject was indeed *preparing* to act, even though the action was aborted by the subject. All of us, not just experimental subjects, have experienced our vetoing a spontaneous urge to perform some act. This often occurs when the urge to act involves some socially unacceptable consequence, like an urge to shout some obscenity at the professor. (Incidentally, in the disorder called Tourette's syndrome, subjects do spontaneously shout obscenities. These acts should not be regarded as freely voluntary. No RP appears before such an act. A quick reaction to an unwarned stimulus also lacks a preceding RP, and it is not a freely voluntary act.)

Another hypothetical function for conscious will could be to serve as a "trigger" that is required to enable the volitional process to proceed to final action. However, there is no evidence for this, such as there is for a veto function, and the "trigger" possibility also seems unlikely on other grounds. For example, voluntary acts that become somewhat "automatic" can be performed with no reportable conscious wish to do so; the RP is rather minimal in amplitude and duration before such automatic acts. Automatic acts clearly go to completion without any conscious trigger available.

Does the Conscious Veto Have a Preceding Unconscious Origin?

One should, at this point, consider the possibility that the conscious veto itself may have its origin in preceding unconscious processes, just as is the case for the development and appearance of the conscious will. If the veto itself were to be initiated and developed unconsciously, the choice to veto would then become an unconscious choice of which we *become* conscious, rather than a consciously causal event. Our own previous evidence had shown that the brain "produces" an awareness of something only after about a 0.5 s period of appropriate neuronal activations (see reviews by Libet, 1993, 1996).

Some have proposed that even an unconscious initiation of a veto choice would nevertheless be a genuine choice made by the individual and could still be viewed as a free will process (e.g., Velmans, 1991). I find such a proposed view of free will to be unacceptable. In such a view, the individual would not consciously control his actions; he would only become aware of an unconsciously initiated choice. He would have no direct conscious control over the nature of any preceding unconscious processes. But, a free will process implies one could be held consciously responsible for one's choice to act or not to act. We do not hold people responsible for actions performed unconsciously, without the possibility of conscious control. For example, actions by a person during a psychomotor epileptic seizure, or by one with Tourette's syndrome, etc., are not regarded as actions of free will. Why then should an act unconsciously developed by a normal individual, a process over which he also has no conscious control, be regarded as an act of free will?

I propose, instead, that the conscious veto may *not* require or be the direct result of preceding unconscious processes. The conscious veto is a *control* function, different from simply becoming aware of the wish to act. There is no logical imperative in any mind-brain theory, even

identity theory, that requires specific neural activity to precede and determine the nature of a conscious control function. And, there is no experimental evidence against the possibility that the control process may appear without development by prior unconscious processes.

Admittedly, to be conscious of the decision to veto does mean one is aware of the event. How may one reconcile this with my proposal? Perhaps we should revisit the concept of awareness, its relation to the content of awareness, and the cerebral processes that develop both awareness and its contents. Our own previous studies have indicated that *awareness* is a unique phenomenon in itself, distinguished from the contents of which one may become aware. For example, awareness of a sensory stimulus can require similar durations of stimulus trains for somatosensory cortex and for medial lemniscus. But the *content* of those awarenesses in these two cases is different, in the subjective timings of sensations (Libet, Wright, Feinstein, & Pearl, 1979). The content of an unconscious mental process (e.g., correct detection of a signal in the brain *without any awareness* of the signal) may be the same as the content *with awareness* of the signal. But to become aware of that same content required that stimulus duration be increased by about 400 ms (see Libet et al., 1991).

In an endogenous, freely voluntary act, awareness of the intention to act is delayed for about 400 ms after brain processes initiate the process unconsciously (Libet, Gleason, et al., 1983; Libet, 1985). Awareness developed here may be thought of as applying to the whole volitional process; that would include the content of the conscious urge to act and the content of factors that may affect a conscious veto. One need not think of awareness of an event as restricted to one detailed item of content in the whole event.

The possibility is not excluded that factors, on which the decision to veto (control) is *based*, do develop by unconscious processes that precede the veto. However, the *conscious decision to veto* could still be made without direct specification for that decision by the preceding unconscious processes. That is, one could consciously accept or reject the program offered up by the whole array of preceding brain processes. The *awareness* of the decision to veto could be thought to require preceding unconscious processes, but the *content* of that awareness (the actual decision to veto) is a separate feature that need not have the same requirement.

WHAT SIGNIFICANCE DO OUR FINDINGS HAVE FOR VOLUNTARY ACTS IN GENERAL?

Can we assume that voluntary acts other than the simple one studied by us also have the same temporal relations between unconscious brain processes and the appearance of the conscious wish/will to act? It is common in scientific researches to be limited technically to studying a process in a simple system; and then to find that the fundamental behavior discovered with the simple system does indeed represent a phenomenon that appears or governs in other related and more complicated systems. For example, the charge on a single electron was measured by Milliken in one isolated system, but it is valid for electrons in all systems. It should also be noted that RPs have been found by other investigators to precede other more complex volitional acts, such as beginning to speak or to write; they did not, however, study the time of appearance of the conscious wish to begin such acts. We may, therefore, allow ourselves to consider what general implications may follow from our experimental findings, while recognizing that an extrapolation to encompass voluntary acts in general has been adopted.

We should also distinguish between *deliberations* about what choice of action to adopt (including preplanning of when to act on such a choice) and the final intention actually "to act now." One may, after all, deliberate all day about a choice but never act; there is *no voluntary act* in that case. In our experimental studies we found that in some trials subjects engaged in some conscious preplanning of roughly when to act (in the next second or so). But even in those cases, the subjects reported times of the conscious wish to actually act to be about −200 ms; this value was very close to the values reported for fully spontaneous voluntary acts with no preplanning.

The onset of the unconscious brain process (RP) for preparing to act was well before the final conscious intention "to act now" in all cases. These findings indicated that the sequence of the volitional processes "to act now" may apply to all volitional acts, regardless of their spontaneity or prior history of conscious deliberations.

ETHICAL IMPLICATIONS OF HOW FREE WILL OPERATES

The role of conscious free will would be, then, not to initiate a voluntary act, but rather to *control* whether the act takes place. We may view the unconscious initiatives for voluntary actions as "bubbling up" in the brain. The conscious-will then selects which of these initiatives may go forward to an action or which ones to veto and abort, with no act appearing.

This kind of role for free will is actually in accord with religious and ethical strictures. These commonly advocate that you "control yourself." Most of the Ten Commandments are "do not" orders.

How do our findings relate to the questions of when one may be regarded as guilty or sinful, in various religious and philosophical systems? If one experiences a conscious wish or urge to perform a socially unacceptable act, should that be regarded as a sinful event even if the urge has been vetoed and no act has occurred? Some religious systems answer "yes." President Jimmy Carter admitted to having had urges to perform a lustful act. Although he did not act, he apparently still felt sinful for having experienced a lustful urge.[1] But any such urges would be initiated and developed in the brain unconsciously, according to our findings. The mere appearance of an intention to act could not be controlled consciously; only its final consummation in a motor act could be consciously controlled. Therefore, a religious system that castigates an individual for simply having a mental intention or impulse to do something unacceptable, even when this is not acted out, would create a physiologically insurmountable moral and psychological difficulty.

Indeed, insistence on regarding an unacceptable urge to act as sinful, even when no act ensues, would make virtually all individuals sinners. In that sense such a view could provide a physiological basis for "original sin"! Of course, the concept of "original sin" can be based on other views of what is regarded as sinful.

Ethical systems deal with moral codes or conventions that govern how one behaves toward or interacts with other individuals; they are presumably dealing with actions, not simply with urges or intentions. Only a motor act by one person can directly impinge on the welfare of another. Since it is the performance of an act that can be consciously controlled, it should be legitimate to hold individuals guilty of and responsible for their acts.

DETERMINISM AND FREE WILL

There remains a deeper question about free will that the foregoing considerations have not addressed. What we have achieved experimentally is some knowledge of how free will may operate. But we have not answered the question of whether our consciously willed acts are fully determined by natural laws that govern the activities of nerve cells in the brain, or whether acts and the conscious decisions to perform them can proceed to some degree independently of natural determinism. The first of these options would make free will illusory. The conscious feeling of exerting one's will would then be regarded as an epiphenomenon, simply a by-product of the brain's activities but with no causal powers of its own.

First, it may be pointed out that free choices or acts are *not predictable*, even if they should be completely determined. The "uncertainty principle" of Heisenberg precludes our having a complete knowledge of the underlying molecular activities. Quantum mechanics forces us to deal with probabilities rather than with certainties of events. And, in chaos theory, a random event may shift the behavior of a whole system, in a way that was not predictable. However, even if events are not predictable in practice, they might nevertheless be in accord with natural laws and therefore determined.

Let us rephrase our basic question as follows: *Must* we accept determinism? Is nondeterminism

a viable option? We should recognize that both of these alternative views (natural law determinism vs. nondeterminism) are unproven theories, i.e., unproven in relation to the existence of free will. Determinism has on the whole, worked well for the physical observable world. That has led many scientists and philosophers to regard any deviation from determinism as absurd and witless, and unworthy of consideration. But there has been no evidence, or even a proposed experimental test design, that definitively or convincingly demonstrates the validity of natural law determinism as the mediator or instrument of free will.

There is an unexplained gap between the category of physical phenomena and the category of subjective phenomena. As far back as Leibniz it was pointed out that if one looked into the brain with a full knowledge of its physical makeup and nerve cell activities, one would see nothing that describes subjective experience. The whole foundation of our own experimental studies of the physiology of conscious experience (beginning in the late 1950s) was that externally observable and manipulable brain processes and the related reportable subjective introspective experiences must be studied simultaneously, as independent categories, to understand their relationship. The assumption that a deterministic nature of the physically observable world (to the extent that may be true) can account for subjective conscious functions and events is a speculative *belief*, not a scientifically proven proposition.

Nondeterminism, the view that conscious-will may, at times, exert effects not in accord with known physical laws, is of course also a nonproven speculative belief. The view that conscious will can affect brain function in violation of known physical laws, takes two forms. In one it is held that the violations are not detectable, because the actions of the mind may be at a level below that of the uncertainty allowed by quantum mechanics. (Whether this last proviso can in fact be tenable is a matter yet to be resolved). This view would thus allow for a nondeterministic free will without a perceptible violation of physical laws. In a second view it may be held that violations of known physical laws are large enough to be detectable, at least in principle. But, it can be argued, detectability in actual practice may be impossible. That difficulty for detection would be especially true if the conscious will is able to exert its influence by minimal actions at relatively few nerve elements; these actions could serve as triggers for amplified nerve cell patterns of activity in the brain. In any case, we do not have a scientific answer to the question of which theory (determinism or nondeterminism) may describe the nature of free will.

However, we must recognize that the almost universal experience that we can act with a free, independent choice provides a kind of prima facie evidence that conscious mental processes can causatively control some brain processes (Libet, 1994). As an experimental scientist, this creates more difficulty for a determinist than for a nondeterminist option. The phenomenal fact is that most of us feel that we do have free will, at least for some of our actions and within certain limits that may be imposed by our brain's status and by our environment. The intuitive feelings about the phenomenon of free will form a fundamental basis for views of our human nature, and great care should be taken not to believe allegedly scientific conclusions about them which actually depend upon hidden ad hoc assumptions. A theory that simply interprets the phenomenon of free will as illusory and denies the validity of this phenomenal fact is less attractive than a theory that accepts or accommodates the phenomenal fact.

In an issue so fundamentally important to our view of who we are, a claim for illusory nature should be based on fairly direct evidence. Such evidence is not available; nor do determinists propose even a potential experimental design to test the theory. Actually, I myself proposed an experimental design that could test whether conscious will could influence nerve cell activities in the brain, doing so via a putative "conscious mental field" that could act without any neuronal connections as the mediators (Libet, 1994). This difficult though feasible experiment has, unfortunately, still to be carried out. If it should turn out to confirm the prediction of that field theory, there would be a radical transformation in our views of mind-brain interaction.

My conclusion about free will, one genuinely free in the nondetermined sense, is then that its existence is at least as good, if not a better, scientific option than is its denial by determinist theory. Given the speculative nature of both determinist and nondeterminist theories, why not adopt the view that we do have free will (until some real contradictory evidence may appear, if it ever does). Such a view would at least allow us to proceed in a way that accepts and accommodates our own deep feeling that we do have free will. We would not need to view ourselves as machines that act in a manner completely controlled by the known physical laws. Such a permissive option has also been advocated by the neurobiologist Roger Sperry (see Doty, 1998).[2]

I close, then, with a quotation from the great novelist Isaac Bashevis Singer that relates to the foregoing views. Singer stated his strong belief in our having free will. In an interview (Singer, 1981/1968) he volunteered that "The greatest gift which humanity has received is free choice. It is true that we are limited in our use of free choice. But the little free choice we have is such a great gift and is potentially worth so much that for this itself life is worthwhile living."

NOTES

1. President Carter was drawing on a Christian tradition deriving from the following two verses in the Sermon on the Mount: "[Jesus said], "Ye have heard that it was said by them of old time, Thou shalt not commit adultery: But I say unto you, That whosoever looketh on a woman to lust after her hath committed adultery with her already in his heart'" (Matthew 5.27–28).
2. The belief by many people that one's fate is determined by some mystical reality or by divine intervention produces a difficult paradox for those who also believe we have free will and are to be held responsible for our actions. Such a paradox can arise in the Judeo-Christian view that (a) God is omnipotent, knows in advance what you are going to do, and controls your fate, while (b) also strongly advocating that we can freely determine our actions and are accountable and responsible for our behavior. This difficulty has led to some theological attempts to resolve the paradox. For example, the Kabbalists proposed that God voluntarily gave up his power to know what man was going to do, in order to allow man to choose freely and responsibly, and to possess free will.

REFERENCES

Doty, R. W. (1998) Five mysteries of the mind, and their consequences. In A. Puente (Ed.), *Views of the brain: A tribute to Roger W. Sperry*. Washington, DC: American Psychological Association.

Kornhuber, H., & Deecke, L. (1965). Hirnpotentialanderungen bei Willkurbewegungen und passiven Bewegungen des Menschen: Bereitschaftspotential und reafferente Potentiale. *Pfluegers Arch Gesamte Physiol Menschen Tiere, 284,* 1–17.

Libet, B. (1985). Unconscious cerebral initiative and the role of conscious will in voluntary action. *Behavioral and Brain Sciences, 8,* 529–566.

Libet, B. (1989). Conscious subjective experience vs. unconscious mental functions: A theory of the cerebral processes involved. In R. M. J. Cotterill (Ed.), *Models of Brain Function*. New York: Cambridge University Press.

Libet, B. (1993). The neural time factor in conscious and unconscious mental events. In Ciba Foundation, *Experimental and Theoretical Studies of Consciousness*. Ciba Foundation Symposium 174. Chichester: Wiley.

Libet, B. (1994). A testable field theory of mind-brain interaction. *Journal of Consciousness Studies, 1*(1), 119–126.

Libet, B. (1996). Neural time factors in conscious and unconscious mental function. In S. R. Hameroff, A. Kaszniak, & A. Scott (Eds.), *Toward a Science of Consciousness*. Cambridge, MA: MIT Press.

Libet, B., Gleason, C. A., Wright, E. W., & Pearl, D. K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness potential): The unconscious initiation of a freely voluntary act. *Brain, 106,* 623–642.

Libet, B., Pearl, D. K., Morledge, D. E., Gleason, C. A., Hosobuchi, Y., & Barbaro, N. M. (1991). Control of the transition from sensory detection to sensory awareness in man by the duration of a thalamic stimulus: The cerebral time-on factor. *Brain, 114,* 1731–1757.

Libet, B., Wright, E. W., & Gleason, C. A. (1982). Readiness potentials preceding unrestricted spontaneous pre-planned voluntary

acts. *Electroencephalography and Clinical Neurophysiology, 54,* 322–325.

Libet, B.,Wright, E. W., & Gleason, C. A. (1983). Preparation—or intention-to-act, in relation to pre-event potentials recorded at the vertex. *Electroencephalography and Clinical Neurophysiology, 56,* 367–372.

Libet, B., Wright, E. W., Jr., Feinstein, B., & Pearl, D. K. (1979). Subjective referral of the timing for a conscious sensory experience: A functional role for the somatosensory specific projection system in man. *Brain, 102,* 191–222.

Singer, I. B. (1981/1968). Interview by H. Flender. In G. Plimpton (Ed.), *Writers at Work.* New York: Penguin Books.

Spence, S. A., & Frith, C. D. (1999). Towards a functional anatomy of volition. *Journal of Consciousness Studies, 6*(8–9), 11–29.

Velmans, M. (1991). Is human information processing conscious? *Behavioral and Brain Sciences, 3,* 651–669.

CHAPTER 2

Why Libet's Studies Don't Pose a Threat to Free Will

Adina L. Roskies

Benjamin Libet's controversial papers on the neural basis of action and the relation between action and conscious intention have dominated discussions of the effects that neuroscientific understanding can have on our conception of ourselves as free and responsible agents. In a collection of studies spanning almost 40 years, Libet developed a series of claims that purport to undermine our common conceptions of ourselves as agents who act because of conscious volition. Instead, Libet paints a picture of ourselves as beings hijacked by automatic, nonconscious brain processes that initiate actions prior to our awareness of our own intentions to act. Consciousness of intention follows, rather than precedes, the initiation of action, and our perception that we consciously initiate our actions is merely illusion. Although Libet attempted to "save the phenomenon" of freedom by postulating that we nonetheless have veto power over our automatically generated actions (i.e., that we have "free won't"), if his primary claims stand they pose a real challenge to our commonsense intuitions about our own autonomy.

In this paper, I will review Libet's main claims, and the implications he drew from them about free will and responsibility. Then I'll consider first whether, on the supposition that the claims are correct, the empirical interpretations that Libet and many since have gleaned from his data really are warranted (hint: the answer is probably not). In the second part of the discussion I address whether his empirical claims really have the implications he thinks they have for free will. In sum, I argue that neither Libet's data nor the reasoning that follows strongly support the fairly radical claims about free will that many have supposed.

I. LIBET'S RESULTS AND TECHNICAL COMMENTARY

1. Summary of Libet's Empirical Results

Libet's main empirical findings are the following:

E1) Direct stimulation of somatosensory cortex (central stimulus presentation) with trains of electrical pulses at liminal levels of intensity leads to a conscious perception of sensation only after a significant period of time, usually 500 ms or more (Libet et al., 1964). Stimulation at liminal levels for less than that duration produced no conscious experience (Libet et al., 1964). Direct stimulation at supraliminal levels shortened the time required for a conscious perception (Libet et al., 1964).

E2) Subjects report consciousness of somatosensory stimuli delivered to the peripheral nervous system with a much shorter latency than the direct cortical stimuli reported in (E1). In fact, subjects can accurately report the time at which they become conscious of a peripheral stimulus to within approximately 50–100 ms of when the stimulus actually occurred (Libet, Wright,