

# FREE WILL: ACTION THEORY MEETS NEUROSCIENCE (excerpts)

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## 2. Some Conceptual Distinctions

A 1983 article by physiologist Benjamin Libet and colleagues has been described as “one of the most philosophically challenging papers in modern scientific psychology” (Haggard et al 1999, p. 291). A striking thesis of that 1983 article is that “the brain . . . ‘decides’ to initiate or, at the least, prepare to initiate [certain actions] at a time before there is any reportable subjective awareness that such a decision has taken place” (p. 640; also see Libet 1985, p. 536).<sup>1</sup> In a recent article, Libet pointedly asserts: “If the ‘act now’ process is initiated unconsciously, then conscious free will is not doing it” (2001, p. 62; also see 2004, p. 136).

Because Libet uses such terms as “decision,” “intention,” “wanting,” “wish,” and “urge” interchangeably, some conceptual preliminaries are in order in interpreting his work.<sup>2</sup> Most people recognize that deciding to do something differs from having an urge or wanting to do something. For example, you might have an urge to scream at an irritating colleague but decide not to. And you might want to have a second helping of dessert but decide to stop at one. If, as I believe, to decide to A is to perform a momentary mental action of forming an intention to A, then in deciding to stop at one dessert you form an intention to stop at one. Your having that intention also differs from your merely wanting to stop at one dessert. After all, you might want to have another dessert (it is very tempting) while also wanting to refrain from having it (you are concerned about your weight); but intending to have a second helping of dessert while intending to refrain from doing that, if it is possible at all, would be a sign of a serious disorder. Similarly, you might want to meet one friend at a 7:00 movie tonight, want to meet another at a 7:00 play, and be unsettled about what to do. At this point, you want to do each of these things and lack an intention about which of them to do.

In saying that deciding is momentary, I mean to distinguish it from, for example, a combination of deliberating and deciding. Someone who is speaking loosely

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<sup>1</sup> In a later article, Libet writes: “the brain has begun the specific preparatory processes for the voluntary act well before the subject is even aware of any wish or intention to act” (1992, p. 263).

<sup>2</sup> Some passages in which two or more of these terms are used interchangeably are quoted in Sections 3 and 4 below. Libet, Gleason *et al* report that “the subject was asked to note and later report the time of appearance of his conscious awareness of ‘wanting’ to perform a given selfinitiated movement. The experience was also described as an ‘urge’ or ‘intention’ or ‘decision’ to move, though subjects usually settled for the words ‘wanting’ or ‘urge’” (1983, p. 627).

may say, “I was up all night deciding to sell my house” when what he means is that he was up all night deliberating or fretting about whether to sell his house and eventually decided to sell it. Deciding to A, on my view, is not a process but a momentary mental action of forming an intention to A, ‘form’ being understood as an action verb.

Not all intentions are formed in acts of deciding. For example, “When I intentionally unlocked my office door this morning, I intended to unlock it. But since I am in the habit of unlocking my door in the morning and conditions . . . were normal, nothing called for a decision to unlock it” (Mele 1992, p. 231). If I had heard a fight in my office, I might have paused to consider whether to unlock the door or walk away, and I might have decided to unlock it. But given the routine nature of my conduct, there is no need to posit an act of intention formation in this case. My intention to unlock the door may have been acquired without having been actively formed. If, as I believe, all decisions are prompted partly by uncertainty about what to do, in situations in which there is no such uncertainty, no decisions will be made.

Some of our decisions and intentions are for the nonimmediate future and others are not. I might decide on Monday to attend a lecture on Friday, and I might decide now to phone my sister now. The intention formed in the former decision is aimed at action four days in the future. The intention I form when I decide to phone my sister now is about what to do now. I call intentions and decisions of these kinds, respectively, distal and proximal intentions and decisions. Proximal decisions and intentions also include decisions and intentions to continue doing something that one is doing and decisions and intentions to start A-ing (e.g., start climbing a hill) straightaway.

A distinction between relatively specific and relatively unspecific intentions also is in order. Ann now intends to buy a particular Ford Escort that she saw yesterday. That is a more specific intention than the intention she had three months ago, in January, to buy a new car this year. In another illustration, Bob has agreed to be a subject in an experiment in which subjects are instructed to salute whenever they feel like it on at least forty occasions during a two hour period. When Bob begins his participation in the experiment he has a relatively unspecific intention to salute many times during the next two hours. At various times during the experiment he has specific proximal intentions to salute.

### **3. Libet’s Work**

This section develops an interpretation of Libet’s work that is sensitive to the conceptual points just made. In some of his studies, subjects are instructed to flex their right wrists or the fingers of their right hands whenever they wish. Electrical readings from the scalp – averaged over at least 40 flexings for each subject – show a “negative shift” in “readiness potentials” (RPs) beginning at about 550 milliseconds (ms) before the time at which an electromyogram

shows relevant muscular motion to begin.<sup>3</sup> Subjects are also instructed to “recall . . . the spatial clock position of a revolving spot at the time of [their] initial awareness” of something,  $x$ , that Libet variously describes as an “intention,” “urge,” “wanting,” “decision,” “will,” or “wish” to move. On average, “RP onset” preceded what subjects reported to be the time of their initial awareness of  $x$  (time  $W$ ) by 350 ms. Time  $W$ , then, preceded the beginning of muscle motion by about 200 ms.

Figure 1

-550 ms	-200 ms	0 ms
RP onset	time $W$	muscle begins to move

(Libet finds independent evidence of a slight error in subjects’ recall of the times at which they first become aware of sensations. Correcting for that error, time  $W$  is -150 ms.) At what point, if any, does a specific intention to flex arise in Libet’s subjects? Again, Libet writes: “the brain ‘decides’ to initiate or, at least, to prepare to initiate the act before there is any reportable subjective awareness that such a decision has taken place” (1985, p. 536). If we ignore the second disjunct, this quotation (given its context) apparently offers the answer that a specific intention to flex appears on the scene with “RP onset,” about 550 ms before relevant muscular motion and about 350 to 400 ms before the agent becomes aware of the intention; for to decide to initiate an act is to form an intention to initiate it.<sup>4</sup> But are decision and intention the most suitable mental items to associate with RP onset? Again, Libet describes the relevant occurrence of which the agent later becomes aware not only as a “decision” and the onset of an “intention” to move, but also as the onset of an “urge,” “wanting,” and a “wish” to move. This leaves it open that at -550 ms, rather than acquiring an intention or making a decision of which he is not conscious, the person instead acquires an urge or desire of which he is not conscious . . .

I believe that if Libet himself were to distinguish between intending and wanting (including having an urge) along the lines I sketched, he might find it more credible to associate the readiness potentials with the latter than with the former. To explain why, I turn to another experiment reported in Libet 1985 (and elsewhere).

Libet proposes that “conscious volitional control may operate not to initiate the volitional process but to select and control it, either by permitting or triggering the final motor outcome of the unconsciously initiated process or by vetoing the

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<sup>3</sup> For background on the generation, analysis, and use of electroencephalograms (EEGs) and “event-related brain potentials,” including readiness potentials, see Coles and Rugg 1995.

<sup>4</sup> I say “apparently,” because an author may wish to distinguish an intention to flex one’s wrist from an intention to initiate a flexing of one’s wrist. I discuss initiation in Section 4. For completeness, I observe that if we instead ignore the quotation’s first disjunct, it makes a claim about when an intention to prepare to flex – or to prepare to initiate a flexing of one’s wrist – arises.

progression to actual motor activation” (1985, p. 529; also see 1999, p. 54, 2004, pp. 139, 142-43, 149). “In a veto, the later phase of cerebral motor processing would be blocked, so that actual activation of the motoneurons to the muscles would not occur” (1985, p. 537). Libet offers two kinds of evidence to support the suggestion about vetoing. One kind is generated by an experiment in which subjects are instructed both to prepare to flex their fingers at a prearranged time (as indicated by a revolving spot on a clock face) and “to veto the developing intention/preparation to act . . . about 100 to 200 ms before the prearranged clock time” (p. 538). Subjects receive both instructions at the same time. Libet writes:

a ramplike pre-event potential was still recorded . . . resembl[ing] the RP of self-initiated acts when preplanning is present. . . . The form of the ‘veto’ RP differed (in most but not all cases) from those ‘preset’ RPs that were followed by actual movements [in another experiment]; the main negative potential tended to alter in direction (flattening or reversing) at about 150-250 ms before the preset time. . . . This difference suggests that the conscious veto interfered with the final development of RP processes leading to action. . . . The preparatory cerebral processes associated with an RP can and do develop even when intended motor action is vetoed at approximately the time that conscious intention would normally appear before a voluntary act. (1985, p. 538)

Keep in mind that the subjects were instructed in advance not to flex their fingers, but to prepare to flex them at the prearranged time and to “veto” this. The subjects intentionally complied with the request. They intended from the beginning not to flex their fingers at the appointed time. So what is indicated by the RP? Presumably, not the acquisition or presence of an intention to flex; for then, at some point in time, the subjects would have both an intention to flex at the prearranged time and an intention not to flex at that time. And how can a normal agent simultaneously be settled on A-ing at t and settled on not A-ing at t?<sup>5</sup> That is, it is very plausible that Libet is mistaken in describing what is vetoed as “intended motor action” (p. 538; my emphasis).

If the RP in the veto scenario is not associated with an intention to flex at the appointed time, with what might it be associated? . . . Even if “intention” and “decision” (to flex) are not apt choices, “urge” and “wanting” are still in the running.

If “RP onset” in cases of “spontaneous” flexing indicates the emergence of an urge to flex soon, proximal intentions to flex may emerge at some point between RP onset and time W, at time W, or after time W: at time W the agent may be aware only of an urge that has not yet issued in a proximal intention. . . .

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<sup>5</sup> I do not wish to exclude the possibility of such settledness in commissurotomy cases.

Although I will not make much of the following point, it should be observed that urges that may be correlated with RP onset at -550 ms might not be proximal urges, strictly speaking. Possibly, they are urges to flex very soon, as opposed to urges to flex straightaway. And perhaps they evolve into, or produce, proximal urges. Another possibility is that urges to flex very soon give rise to proximal intentions to flex without first evolving into or producing proximal urges to flex. Some disambiguation is in order. A smoker who is rushing toward a smoking section in an airport with the intention of lighting up as soon as he enters it wants to smoke soon. That want or desire has a specific temporal target – the time at which he enters the smoking section. A smoker walking outside the airport may want to smoke soon without having a specific time in mind. Libet's subjects, like the latter smoker, might at times have urges or desires to flex that lack a specific temporal target. Desires to A very soon, or to A, beginning very soon, in this sense of “very soon,” are roughly proximal action-desires.

Libet's experimental design promotes consciousness of urges and intentions to flex, since his subjects are instructed in advance to be prepared to report on them – or something like them – later, using the clock to pinpoint the time they are first noticed. For my purposes, what is of special interest are the relative times of the emergence of a (roughly) proximal urge or desire to flex, the emergence of a proximal intention to flex, and consciousness of the intention. If RP onset indicates the emergence of proximal, or roughly proximal, urges to flex, and if acquisitions of corresponding proximal intentions directly activate the motoneurons to the relevant muscles, we have the following picture of subjects instructed to flex “spontaneously” ...:

Figure 2

- a. -550 ms: proximal or roughly proximal urge to flex emerges
- b. -90 to -50 ms: acquisition of corresponding proximal intention<sup>9</sup>
- c. 0 ms: muscle begins to move.

Possibly, the intention is consciously acquired. My point here is simply that this figure is consistent with Libet's data ...

I mentioned that Libet offered a second kind of evidence for “veto control.” Subjects instructed to flex “spontaneously” (in non-veto experiments) “reported that during some of the trials a recallable conscious urge to act appeared but was ‘aborted’ or somehow suppressed before any actual movement occurred; in such cases the subject simply waited for another urge to appear, which, when consummated, constituted the actual event whose RP was recorded” (1985, p. 538). RPs were not recorded for suppressed urges. But if these urges fit the pattern of the unsuppressed ones in cases of “spontaneous” flexing, they appeared on the scene about 550 ms before the relevant muscles would have moved if the subjects had not “suppressed” the urges, and subjects did not become conscious of them for about another 350 to 400 ms. Notice that it is

urges that these subjects are said to report and abort or suppress. This coheres with my “urge” hypothesis ...

Does the brain decide to initiate actions “at a time before there is any reportable subjective awareness that such a decision has taken place” (Libet, Gleason et al 1983, p. 640)? Libet and his colleagues certainly have not shown that it does, for their data do not show that any such decision has been made before time W or before the time at which their subjects first are aware of a decision or intention to flex. Nothing justifies the claim that what a subject becomes aware of at time W is a decision to flex that has already been made or an intention to flex that has already been acquired, as opposed, for example, to an urge to flex that has already arisen.

Indeed, the data about vetoing, as I have explained, can reasonably be used to argue that the “urge” hypothesis about what the RPs indicate is less implausible than the “decision” or “intention” hypothesis. Now, there certainly seems to be a connection between what happens at -550 ms and subsequent muscle motion in cases of “spontaneous” flexing. But it obviously is not a temporally direct connection. Between the former and latter times, subjects apparently form or acquire proximal intentions to flex, in those cases in which they do intentionally flex. And, for all Libet’s data show, those intentions may be consciously formed or acquired.

#### **4. Free Will**

... In a recent article, Libet writes: “it is only the final ‘act now’ process that produces the voluntary act. That ‘act now’ process begins in the brain about 550 msec before the act, and it begins unconsciously” (2001, p. 61).<sup>6</sup> “There is,” he says, “an unconscious gap of about 400 msec between the onset of the cerebral process and when the person becomes consciously aware of his/her decision or wish or intention to act.” (Incidentally, a page later, he identifies what the agent becomes aware of as “the intention/wish/urge to act” [p. 62].)

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<sup>6</sup> When does the action begin in all this – that is, the person’s flexing his wrist or fingers? This is a conceptual question, of course: how one answers it depends on one’s answer to the question “What is an action?” Libet identifies “the actual time of the voluntary motor act” with the time “indicated by EMG recorded from the appropriate muscle” (1985, p. 532). I favor an alternative position, but there is no need to disagree with Libet about this for the purposes of this article. Following Brand 1984, Frederick Adams and I have defended the thesis that overt intentional actions (i.e., intentional actions that essentially involve peripheral bodily motion) begin in the brain, just after the acquisition of a proximal intention; the action is proximally initiated by the acquisition of the intention (Adams and Mele 1992). (One virtue of this view is that it helps handle certain problems about deviant causal chains: see Mele 2003, ch. 2.) The relevant intention may be understood, in Libet’s words, as an intention “to act now” (1989, p. 183; 1999, p. 54; 2004, p. 148), a proximal intention. (Of course, for Libet, as for me, “now” need not mean “this millisecond.”) If I form the intention now to start running now, the action that is my running may begin just after the intention is formed, even though the relevant muscular motions do not begin until milliseconds later.

Libet adds: “If the ‘act now’ process is initiated unconsciously, then conscious free will is not doing it.”

I have already explained that Libet has not shown that a decision to flex is made or an intention to flex acquired at -550 ms. But even if the intention emerges much later, that is compatible with an “act now” process having begun at -550 ms. One might say that “the ‘act now’ process” in Libet’s spontaneous subjects begins with the formation or acquisition of a proximal intention to flex, much closer to the onset of muscle motion than -550 ms, or that it begins earlier, with the beginning of a process that issues in the intention.<sup>11</sup> We can be flexible about that (just as we can be flexible about whether the process of my baking my frozen pizza began when I turned my oven on to pre-heat it, when I opened the oven door five minutes later to put the pizza in, when I placed the pizza on the center rack, or at some other time). Suppose we say that “the ‘act now’ process” begins with the unconscious emergence of an urge to flex – or with a pretty reliable relatively proximal causal contributor to urges to flex – at about -550 ms and that the urge plays a significant role in producing a proximal intention to flex many milliseconds later. We can then agree with Libet that, given that the “process is initiated unconsciously, . . . conscious free will is not doing it” – that is, is not initiating “the ‘act now’ process.” But who would have thought that conscious free will has the job of producing urges? In the philosophical literature, free will’s primary locus of operation is typically identified as deciding (or choosing); and for all Libet has shown, if his subjects decide (or choose) to flex “now,” they do so consciously.

Libet asks (2001, p. 62), “How would the ‘conscious self’ initiate a voluntary act if, factually, the process to ‘act now’ is initiated unconsciously?” Here is one answer. An “‘act now’ process” that is initiated unconsciously may be aborted by the agent; that apparently is what happens in instances of spontaneous vetoing, if “‘act now’ processes” start when Libet says they do.<sup>7</sup> Now, processes have parts, and the various parts of a process may have more and less proximal initiators. A process that is initiated by the welling up of an unconscious urge may have a subsequent part that is directly initiated by the conscious formation or acquisition of an intention. “The ‘conscious self’” – which need not be understood as something mysterious – might more proximally initiate a voluntary act that is less proximally initiated by an unconscious urge.

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Nothing warrants Libet’s claim that ... RPs are correlated with decisions or intentions rather than with urges strong enough to issue pretty regularly in related intentions and actions. Moreover, that, in certain settings, (roughly)

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<sup>7</sup> Notice that in addition to “vetoing” urges for actions that are not yet in progress, agents can abort attempts, including attempts at relatively temporally “short” actions. When batting, baseball players often successfully halt the motion of their arms while a swing is in progress. Presumably, they acquire or form an intention to stop swinging while they are in the process of executing an intention to swing.

proximal urges to do things arise unconsciously – urges on which the agent may or may not act about half a second after they arise – is no cause for worry about free will. Even if one grants Libet much more than his critics tend to grant him, as I have done, it can be shown that his data fall well short of providing good grounds for accepting his main theses.

## 5. Further Testing

I have argued that the “urge” hypothesis about what the type II RPs indicate in Libet’s studies is less implausible than the “decision” or “intention” hypothesis. Is there an independent way to test these hypotheses – that is, to gather evidence about whether it is (roughly) proximal urges that emerge around -550 ms in Libet’s studies or instead decisions or intentions?<sup>8</sup> ...

If makings of proximal decisions to flex or acquisitions of proximal intentions to flex (or the physical events that realize these things) cause muscle motion, how long does it take them to do that? Does it take about 550 ms? Might reaction time experiments show that 550 ms is too long a time for this? ... In reaction time experiments, subjects have decided in advance to perform the assigned task – to “A,” for short – whenever they perceive the relevant signal. When they perceive the signal, there is no need for a proximal decision to A, as Deeke observes (p. 59). (If all decisions are responses to uncertainty about what to do and subjects are not uncertain about what to do when they perceive the signal, there is no place here for proximal decisions to A.) However, it is plausible that when they perceive the signal, they acquire an intention to A now, a proximal intention. That is, it is plausible that the combination of their conditional intention to A whenever they perceive the signal (or the neural realizer of that intention) and their perception of the signal (or the neural realizer of that perception) produces a proximal intention to A. The acquisition of this intention (or the neural realization of that event) would then initiate the A-ing.<sup>9</sup> And in at least one reaction time experiment (described shortly) that is very similar to Libet’s main experiments, the time between the “go” signal and the onset of muscle motion is much shorter than 550 ms. This is evidence that proximal intentions to flex – as opposed to (roughly) proximal urges to flex – emerge much closer to the time of the onset of muscle motion than 550 ms. There is no reason, in principle, that it should take people any longer to start flexing their

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<sup>8</sup> Again, a more cautious formulation of the urge hypothesis is disjunctive and includes the possibilities that what emerges around -550 ms is a (roughly) proximal urge to flex, a pretty reliable relatively proximal causal contributor to such an urge, a (roughly) proximal urge to “prepare” to flex, a simulation of an urge of either kind, and the motor preparedness typically associated with such urges.

<sup>9</sup> Hereafter, the parenthetical clauses should be supplied by the reader. Intentions, in my view, are realized in physical states and events, and their causes are or are realized in physical states and events. I leave it open here that although intentions enter into causal explanations of actions, the causal work is done, not by them (qua intentions), but by their physical realizers. I forego discussion of the metaphysics of mental causation, but see Mele 1992, ch. 2.



wrists when executing a proximal intention to flex in Libet's studies than it takes them to do this when executing such an intention in a reaction time study. ...

The reaction time study I mentioned is reported in Haggard and Magno 1999:

Subjects sat at a computer watching a clock hand . . . whose rotation period was 2.56 s. . . . After an unpredictable delay, varying from 2.56 to 8 s, a high-frequency tone . . . was played over a loudspeaker. This served as a warning stimulus for the subsequent reaction. 900 ms after the warning stimulus onset, a second tone . . . was played. [It] served as the go signal. Subjects were instructed to respond as rapidly as possible to the go signal with a right-key press on a computer mouse button. Subjects were instructed not to anticipate the go stimulus and were reprimanded if they responded on catch trials. (p. 103)

"Reaction times were calculated by examining the EMG signal for the onset of the first sustained burst of muscle activity occurring after the go signal" (p. 104). "Reaction time" here, then, starts before any intention to press "now" is acquired: obviously, it takes some time to detect the signal, and if detection of the signal helps to produce a proximal intention, that takes some time too. The mean of the subjects' median reaction times in the control trials was 231 ms (p. 104). If a proximal intention to press was acquired, that happened nearer to the time of muscle motion than 231 ms and, therefore, much nearer than the 550 ms that Libet claims is the time proximal intentions to flex are unconsciously acquired in his studies. Notice also how close we are getting to Libet's time W, his subjects' reported time of their initial awareness of something he variously describes as an "intention," "urge," "wanting," "decision," "will," or "wish" to move (-200 to 150 ms). If proximal intentions to flex are acquired in Libet's studies, Haggard and Magno's results make it look like a good bet that they are acquired around time W. How seriously we should take his subjects' reports of the time of their initial awareness of the urge, intention, or whatever, is a controversial question, and I will say nothing about it here.

... Attention not only to the data but also to the concepts in terms of which the data are analyzed makes it clear that Libet's striking claims about decisions, intentions, and free will are not justified by his results. Libet asserts that his "discovery that the brain unconsciously initiates the volitional process well before the person becomes aware of an intention or wish to act voluntarily . . . clearly has a profound impact on how we view the nature of free will" (2004, p. 201). Not so. That, in certain settings, (roughly) proximal urges to do things arise unconsciously or issue from causes of which the agent is not conscious – urges on which the agent may or may not subsequently act – is a cause neither for worry nor for enthusiasm about free will.