Chapter Six: Time and Experience

1. Fleeting Moments and Hopping Rabbits

In chapter six, the Multiple Drafts Theory is put through a few more runs. The theme of the experiments in this chapter is the way the brain represents temporal order.

Earlier, Dennett brought up two rival Cartesian ways of thinking about how one stimulus could interfere with another: Orwellian and Stalinesque revisions. Under an Orwellian interpretation, you have full consciousness of an experience, but the subsequent memory is overwritten by another stimulus. The Stalinesque alternative is that the second stimulus prevents the first from ever "arriving" at the Cartesian Theater. The feeling of paradox in this chapter's experiments comes from being swayed by one of these metaphors.

Here's one: the cutaneous rabbit. In a typical set up, three mechanical tappers are placed on the subject's arm, starting at the wrist and about a foot apart. First, the tapper at the wrist delivers five quick taps. Then, the tapper at the elbow delivers two more, and the tapper further along delivers a few more. The entire sequence generally lasts from under a second to as many as three.

What subjects feel is a series of evenly spaced taps traveling up the arm, like a hopping rabbit, an obviously inaccurate representation by the brain. How is time misperceived? Dennett puts the problem this way (p. 143):

The brain obviously can't "know" about a tap at the elbow until after it happens. If you are still entranced by the Cartesian Theater, you may want to speculate that the brain delays the conscious experience until after all and the taps have been "received" at some way station in between the arm and the seat of consciousness (whatever that is), and this way station revises the data to fit a theory of motion, and sends the edited version on up to consciousness. But would the brain always delay response to one tap just in case more came? If not, how does it "know" when to delay?

Part of the solution to understanding this experiment and others like it is recognizing the difference between two "spaces": the space of representing and the space represented.

2. How the Brain Represents Time

Suppose someone were to ask "Exactly when did the British Empire become informed of the truce in the War of 1812?"(p. 169). Because the British Empire was nothing over and above its physical institutions and agents, the question has no precise, determined answer. If you want that kind of answer, you'll have to restrict yourself to specific people—say, the British commander in chief in Calcutta.

Imagine how that commander might receive news of two temporally separate events: the signing of Treaty of Ghent on Christmas Eve, 1814, and the Battle of New Orleans, ending on January 8, 1815. Back in the day, news was delivered through sealed and dated letters. So, first, the treaty was signed, and a letter dispatched to India along a slow, difficult, overland path. Then, the battle was fought (because the armies hadn't learned of the treaty yet), and news of the defeat sent via a speedy sea route. The commander receives news of the battle first, and news of the treaty days after that. Since the letters are dated, he understands that the order the letters arrived in does not represent the order the events happened. But if the letters had no date stamp, or a fallible date stamp, or if the commander was senile, it might be very hard for him to draw a conclusion about the real order of events.

This imaginary commander receives information from various far flung agents of the British Empire, and the brain receives nerve impulses from various locations on the body. Certainly, a signal from the toe has much further to travel than one from the forehead. And, or so Cartesian materialism would have us believe, one of the brain's many tasks is to edit signals from different locations so that events that are in fact simultaneous are perceived as such, despite the different arrival times of the information at Central Headquarters.

Evolutionary considerations alone warn us that something must be wrong with this picture. It implies that (for instance) a signal from the forehead would have its entrance to the Cartesian Theater delayed until the signal from

the toe had arrived. This would be inefficient and could even be dangerous, for “it squanders precious time by conceding to the full range of its operations a ‘worst case’ schedule. Why should vitally important signals from the forehead. . .dawdle in the anteroom just because there might someday be an occasion when concurrent signals from the toes need to converge with them somehow?”(p. 145).

The brain must use whatever information it gets to control the body in real time, and survival pressures mean it has to do this quickly. For the brain to take frames in the mental film and edit them correctly for the show in the Cartesian Theater would be as inefficient and meaningless as our commander in Calcutta arranging an historical recreation of the signing of the treaty and the Battle of New Orleans in order to understand which came first. The commander already has a tool available in order to make that determination: the letters contain information representing the dates their respective events took place.

Here we come to the importance Dennett stresses on the distinction between vehicle and content. In the above example, the letters arriving in India are the vehicles of representation, and their content is what is represented. Crucial here is the notion that “In general, we must distinguish features of representings from the features of representeds. Someone can shout “Softly, on tiptoe!” at the top of his lungs. . .the top sentence of a written description of a standing man need not describe his head, nor the bottom sentence his feet. This principle also applies, less obviously so, to time.”(p.147).

Of course, because the brain is controlling a body in real time, it is not utterly free in how it goes about representing time, and its methods must be “anchored to time itself in two ways: the very timing of the representing can be what provides the evidence or determines the content, and the whole point of representing the time of things can be lost if the representing doesn’t happen in time to make the difference it is supposed to make.”(p.151).

This makes things more complicated; the brain just may not have a system as efficient and reliable as the date stamps arriving at Command HQ, at least at the level these experiments probe: events and requested tasks occurring in intervals of just hundreds of microseconds.

3. Libet’s Case of “Backwards Referral in Time”

With these points in mind, we’re ready to look at the first Libet experiment.

Two trains traveling at equal speeds start towards the same destination at the same time. One travels much further than the other, and arrives at the station later. But, the station records it as the first to arrive. What is going on here?

In reality, what happened is that neuroscientists discovered a part of the brain which, if stimulated, would cause a tingling sensation in one hand. Then they tried some novel experiments: why not stimulate that part of the brain in the left hemisphere (producing a tingle in the right hand) and simultaneously create a tingle on the left hand by a mild shock? Compare the real timings with the perceived timings of the subjects.

Intuitively, it would seem that the direct cortical stimulus should be felt first, since obviously, the signals have much less further to travel than the signals coming from the hand. But this isn’t what subjects reported. Even if the brain was stimulated before the hand (up to certain limits), they reported a tingle at the hand first. In Libet’s words, they referred the experience backwards in time.

Libet’s model is Stalinesque: on the road to the Cartesian theater, the cortical stimulus is somehow waylaid from appearing in consciousness, and the brain edits a version of the show in which the stimulus from the hand comes first. Only that version gets a showing in the theater.

Neurophilosopher Patrician Churchland has criticized Libet’s experiments—but from the rival Orwellian perspective. Her position is that the cortical stimulation is actually felt first, but due to interference from the direct stimulation of the hand, the subject “misremembers” the “real” order in which they were experienced.

Note how both theorists are united in a kind of “realism” about this issue. Churchland, for instance, claims that their two approaches differ only on when exactly the two sensations were actually felt (as opposed to what the subjects

say about when they were felt). It's worth quoting a passage from the philosopher S. Harnad, from a commentary appearing in Behavioral and Brain Sciences (appearing under note 10 on page 162 of Consciousness Explained:

"Introspection can only tell us when an event seemed to occur, or which of two events seemed to occur first. There is no independent way of confirming that the real timing was indeed as it seemed."

I mention this in passing because claims of this kind will figure prominently when Dennett begins to talk about "seemings" versus "judgments" as the discussion turns to qualia. Harnad is suggesting that how you think something seemed to you is independent of how it actually seemed to you. Quite literally, the "appearance" versus "reality" distinction normally applied to percepts and reality is now moved inside the head, applying to. . .percepts of percepts? Hmm.

4. Libet's Claims of Subjective Delay of Consciousness of Intention

This next experiment is something I'd like to focus on more than the others, because many in the field have taken it to show more than it actually does. Interpretations have ranged from the mild "this result challenges current models of consciousness" to "Dualism is thus confirmed!".

As above, the misinterpretation of the experiment depends on the notion that there is something called the "absolute timing" of an experience: the exact moment an experience enters the Cartesian theater.

Subjects were asked to watch a spot on a rapidly rotating disk while their brain activities were monitored. The task they were to perform was make a spontaneous decision to flex one hand at the wrist, while noting the location of the dot at the moment they were aware of their intention to flex. Libet interpreted the onset of what he called "readiness potentials"—recorded by electrodes on the scalp—as the initiation of the brain events leading to the wrist flick. What he discovered is that these readiness potentials came about 350 to 400 milliseconds before the moments patients said they were first aware of their desire to make the wrist motion.

His conclusion was that the initiation of voluntary acts begins unconsciously, demonstrating that "your consciousness lags behind the brain processes that actually control your body."(p. 163) One recent book hailed this as evidence that our conscious will is an illusion (Wegner's The Illusion of Conscious Will).

Dennett puts the troublesome idea this way: ". . .it does look ominous to anyone committed to the principle that our conscious acts control our bodily motions. It looks as if we are located in Cartesian Theaters where we are shown, with a half-second tape delay, the real decision making that is going on elsewhere (somewhere we aren't)."(p. 164).

Surely this doesn't bode well for free will, right? Well, there are reasons to reconsider this way of understanding the experiment.

The first consideration that should make us suspicious is that there is no scientific way to discriminate between the Stalinesque interpretation Libet gives to the experiment and the Orwellian alternative. His take is that your consciousness of intention to flick occurs after the 300 ms delay. But he himself admits that there is a problem, before he dismisses it as impossible to verify: the subjects may have been conscious of their intentions at the moment the readiness potential spikes, but memory of the event is wiped out, perhaps by the resources devoted to matching its absolute timing with the current location of the moving dot.

We can play around with these pictures in various ways (here drawn in part from Dennett's most recent book, Freedom Evolves). Versions of each scenario have been endorsed by one scholar or another, but because this is a summary, they have been reduced to sound bite proportions.

To preserve the "causal efficacy" of consciousness, and presumably free will, the Orwellian picture imagines that our mind—not some kind of separate process—initiates the hand flick, and that we are immediately conscious of it. But the subject must match the absolute timing of this event (here presumed in reality to be the onset of the readiness potential) with the current position of the moving dot. Well, other processes are responsible for maintaining a representation of that, and it is a quite real possibility that they take 300 ms to collate and send their

decision over to the seat of consciousness—thus explaining the gap and preserving free will.

A more Stalineque picture imagines that the self is more or less "located" in the part of the brain receiving the most updated perceptions of the physical world—instantly. An unconscious process occurs "elsewhere" to initiate the hand flick (beginning with the readiness potential), and it takes 300 ms for a report of the intention to reach the areas processing perception and thus become conscious.

And if we don't like either of the above, we can go for an even more overtly Cartesian metaphor: you sit in the theater, where reports of various brain processes are sent for your perusal. You have delegated a lot of authority, and one thing you've delegated is the decision to make the hand flick, which (because it happens before arrival at the theater) is entirely unconscious—not really done by you.

It takes time for reports to be written and to travel to the theater. Like the commander in Calcutta, the order in which you receive your reports may differ from the order in which the events they report occurred.

So on one hand, we have reports of intentions being sent, and on the other, reports of the location of the dot being sent. There you are in the Cartesian Theater, tasked with telling where the dot was when the hand-flick-intention-event occurred. The illusion of the delay occurs because, in this highly unusual task for which the brain has underprivileged resources, you inaccurately match up your reports. Was it a Stalinesque error or an Orwellian error? Nothing you discover about the brain or from introspection can tell.

Compare the ease with which outside observers armed with neurological monitoring technology of comic book level powers can objectively time various physical processes happening in your brain, versus the spatially and temporally distributed task your brain must undergo to perform the same operation on itself. I consume none of your brain's resources and initiate no additional brain events in you by looking at it through my magic cerebroscope. But, when your brain monitors itself, this must also take time and involves a fallible interpretation, itself an artifact of the very event so initiated.

When the metaphor of the Cartesian Theater is abandoned in favor of the idea of various drafts of informational content temporarily mobilizing various areas of the brain, the paradox of Libet's experiment vanishes:

There is no one inside, looking at the wide-screen show displayed all over the cortex, even if such a show is discernible by outside observers. What matters is the way those contents get utilized by or incorporated into the processes of ongoing control of behavior, and this must only be indirectly constrained by cortical timing. What matters, once again, is not the temporal properties of the representings, but the temporal properties represented, something determined by how they are 'taken' by subsequent processes in the brain.(p.166)

5. A Treat: Grey Walter's Precognitive Carousel

A caveat before I describe Walter's experiments: Dennett learned of these during a talk Walter gave in 1963. The experiments have never been published in the peer reviewed press, nor have they been followed up by anyone else. Some have concluded from this that he may have been pulling the audience's leg, but there are other possibilities. For a brief report, see footnote 2 on page 240 of Freedom Evolves. Regardless, it's quite possible what I'm about to describe could happen; it works if only as a thought experiment.

Grey Walter implanted electrodes in the motor cortex of his patients and asked them to watch a slide show. As in Libet's previous experiment, they were given a task of free, voluntary action initiation: press a button to rotate the slide show carousel to the next picture. What they did not realize was that the button was a fake, utterly inert. The pictures were instead advanced when the readiness potential in the brains of the patients began to spike.

What the patients reported was surprise: the carousel seemed to psychically "know" when they wanted to go to the next picture. "They reported that just as they were 'about to' push the button, but before they had actually decided to do so, the projector would advance the slide. . ."(p. 167).

Walter never measured this, but we can imagine with the data of Libet and others that there is a time lag of about

300-400 ms between the brain activity and the motor response to push the button. And it makes perfect sense to think that, in the day to day monitoring of intentions, resulting motor activities, and expected responses, that our brains habitually become "used" to that lag, reporting alarm when expectations are thwarted.

All that has happened in this experiment is that the electronic apparatus of the experimental situation is able to carry out the conscious intentions of the subjects faster than they are accustomed to. "The fact that the alarm eventually gets interpreted in the subjective sequence as a perception of misordered events (change before button-push) shows nothing about when in real time the consciousness of the decision to press the button first occurred. The sense the subjects reported of not quite having had time to 'veto' the initiated button-push when they 'saw the slide was already changing' is a natural interpretation for the brain to settle on (eventually) of the various contents made available at various times for incorporation into the narrative."(p. 168)

6. Loose Ends

Dennett briefly reminds us that our normal sense that "our experiences of events occur in the very same order as we experience them to occur"(p.168) is perfectly valid in general, so long as "we restrict our attention to psychological phenomena of 'ordinary,' macroscopic duration."(p. 168) What the sense of paradox in these experiments exploits is the fact that when the time scale involved is a few hundred milliseconds, this general rule no longer applies.

In making this case, however, Dennett tells us that he has left some tantalizing loose ends to be covered later. One of these is "the metaphorical assertion that 'probing' is something that 'precipitates narratives.' The timing of inquisitive probes by experimenters. . .can have a major revisionary effect on the systems of representation utilized by the brain."(p. 169)

The result of such probes—either by an experimenter or one's self—constitute "judgments" about how things seem. But on the Multiple Drafts Model, "there is no further question about whether in addition to such a judgment, and the earlier discriminations on which it is based, there was a presentation of the materials-to-be-interpreted for the scrutiny of a Master Judge, the audience in the Cartesian Theater"(p.170). This will play out later when Dennett moves on to attack qualia.

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