

Dr. Libet's Five Hundred Milliseconds

— Why can human beings check watches? —

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The problems of unconsciousness have been discussed as ineluctable ones from various perspectives in the field of psychology (Osaka, 2013). Libet (2004) shows another viewpoint to discuss unconsciousness. Our brains begin to respond to the sensational stimuli before we notice. The stimuli which excite the cerebral cortex more than 500 milliseconds become conscious, but the ones less than 500 milliseconds remain unconscious, although they are actually processed in our brains. In addition, all the acts are initiated in our brains before they are intended to do consciously. All the related facts are derived through his experiments. In the forward, S. M. Kosslyn, a series editor, says that the discoveries in the research must be discussed in “any theory of consciousness and its neural underpinnings” (Libet, 2004, p. ix). Any theories which try to explain the functions of our brains have to include the discussion. The language model presented in Sato (1995) is applied to the psychological or the linguistic problems such as the theory of mind and the infantile amnesia (Sato, 2014). In this paper, it is shown that all the facts which are presented in Libet (2004) can also be explained in the framework of the model. It must be very important for human beings that our brains can work unconsciously.

Key Words: *Mind Time*, unconsciousness, psychology, brain, the inner world, the language model

Introduction

In the translator's postscript to Dr. Libet's *Mind Time: The temporal factor in consciousness*, Dr. Shimojo, who is a translator of a Japanese version, says that the sustained research is astonishing (Libet, 2004/2005, p. 265). The results should urge us to reconsider a number of problems such as about free will and conscious experience.

In the forward, S. M. Kosslyn, a series editor, says that the discoveries in the research must be discussed in “any theory of consciousness and its neural underpinnings” (Libet, 2004, p. ix). Dr. Libet himself says, “Proposed models or theories are valuable only if they help explain the data, not when they contradict the data” (Libet, 2004, p. 203). The discoveries are the facts that are found through experiments and withstood the test of time.

In this paper, how the discoveries are explained through the language model which is presented in Sato (1995) is discussed.

Time-on theory

It takes about 500 milliseconds (msec) for sensory experiences to be conscious in our brains. Dr. Libet proposes the time-on theory on the basis of his experimental results (Libet, 2004, p.101). Only if the stimuli to the cerebral cortex are longer than 500 msec, they produce awareness, and the stimuli with durations below 500 msec are processed without awareness. However, although the awareness delays 500 msec, the delay is not detected. In addition, the stimuli with awareness are interpreted as stimuli before 500 msec without delay.

All the acts are initiated in the brain before they are intended to do consciously, or with awareness (Libet, 2004, p.123). Voluntary acts without preplanning are initiated in our brain at about -400 msec and those with preplanning are initiated at about -900 msec. The wish to act is noticed consciously, or with awareness, at about -150 msec before the act is actually done. Dr. Libet explains the role of the 150-msec: “That allows it, potentially, to affect or control the final outcome of the volitional process” (Libet, 2004, P. 137).

The inner world

The inner world (IW) is the one which exists in our brains as a copy of the outer world (OW). Sato (2013) hypothesizes the existence of IW, which is described as a copy of OW, or the actual world, discussing the psychological reality of the most abstracted structures in syntax, such as S(subject) + P(predicate) + O(object). Nobody will deny the fact that we human beings store all manner of memories in our brains. The matter will be the way they exist there. In IW, all sorts of experiences in OW are *relived* and *simulated*, and our creative activities are practiced ordinarily. Dr. Libet presents the idea of “a conscious mental field (CMF)” (Libet, 2004, p.168). It might be similar to IW. However, IW is originally hypothesized on the basis of the discussions in which the language model presented in Sato (1995) is applied to the psychological or the linguistic problems such as the theory of mind and the infantile amnesia (Sato, 2014). It seems that the idea of the inner world can be used to discuss wider topics in the fields. So I will advance the discussion by using the term, IW. A human being always compares IW with OW and adjusts details so as to live a satisfying life in the real world (Sato, 1995).

The doings

A human being cannot behave without reference to their own IW, or experiences and simulations. Dr. Libet sometimes refers to the sport performance in order to provide evidence for our unconscious activities. When “imagery training, effect (in Japanese)” was typed into the google search engine, it returned 292 titles (as of June 24, 2014). The results of the training seem to be positive. What can athletes get through the training? In IW, they are experiencing the scenes that they likely happen upon in actual games in OW. They are forming IW for the skills. Through IW, human beings can experience anything in advance. IW is a copy of OW and, that is to say, $IW = actual\ world + \alpha$. I have tried to imagine *something completely novel*, but I have failed so far. If we happened upon a moving fearsome object, we would have a choice of breaking into a run. In that sense, do we face a completely novel experience to which we cannot react at all?

The reactions

Diverse kinds of levels are observed in reactions to all sorts of stimuli, and, in that sense, human beings will have already experienced any scenes when they happen upon the scenes. Needless to say, through the accumulation of actual experiences and the experiences simulated in IW, we always experience slight changes of the reactions to the similar stimuli from OW. We are constantly modifying our IWs so as to handle OW in the way we would like to. In other words, we are ceaselessly getting ready for our OWs. In that sense, human beings have all manner of patterns of behavior or reaction in our IWs.

The retrieval

The system to retrieve something with no stimuli from outside is to be equipped in the brain. The translator of *Mind Time*, Dr. Shimojo, annotates the sentence: “With our approach, we avoided having to deal with the enormously complex necessary background of brain activity” (Libet, 2004, p.38), and says that our brains are spontaneously working at all times (Libet, 2004/2005, p. 45). Sato (2009) proposes that the retrieval is a system with which the brain produces the mind. Kamiya (2008) says that time is little use as a clue for the retrieval in the memory system. When the retrieval in our memory systems is discussed, some stimuli from the outside seem to be almost always presupposed. However, have you ever realized that there are many scenes, in our daily lives, in which you retrieve something without stimuli from the outside? For example, have you ever check your watch spontaneously? It will be understood if it is hypothesized that our brains have a system which functions in order to search IW automatically with no stimuli from the outside. Do you lose your concentration while you are reading? Losing the concentration seems to be very important for human beings, who use calendars and timepieces to synchronize with other people in the societal activities (Sato, 2014). Dreaming during REM sleep might also be the effect of this search in our IWs. It seems to be important to *hit upon* something to do during the light sleep, or something that makes us notice that we should react to things in OW.

Unconscious response

It is important for human beings to respond to the actual world unconsciously by using IW. Libet (2004) says, “The time-on requirement for conscious experiences may

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serve a 'filter function' to limit conscious experiences at any one time" (p. 115). In other words, if they tried to react to all the stimuli in the same way and consciously, human beings could not handle vital stimuli appropriately. When they have a system that works as a filter and are prepared to respond to the similar routine stimuli through IW, they can reduce the noise of information from the outside and treat the essential input properly.

Comparison

For the retrieval, the search of IW and the comparison between IW and OW are indispensable. The retrieval seems to be conscious or unconscious. However, without the search of IW, the essentiality and the vitalness of each stimulus cannot be judged. In order to cause our brains, which accumulate information from OW, or the real world, to function maximally, both the search with the stimuli from the outside and the ones without them must be fundamental.

The experimental results which are reported in Dr. Libet's *Mind Time* will be reread precisely on the basis of the discussion so far.

Intension to act

The intension to act (Libet, 2004, p.123) is to be initiated through the searches with or without the stimuli from OW. Libet (2004) says, "The primary EP is exhibited only in a highly localized small area of sensory cortex. But the later EPs are not confined to the primary sensory cortex; related responses are broadly distributed in the cortex" (p. 85). In other words, the experiences related to a stimulus are being searched in the whole of IW, and the stimulus is given meaning on the basis of all the experiences. If necessary, it will be dealt with as a stimulus, or an experience, with awareness. It is only the primary EP that is observed in a very small area. And only the EP produces "subjective referral backwards in time" (Libet, 2004, p. 199).

The short-term memory discussion

It is the searches in IW, so the counterargument that Libet (2004) brings forward in order to deny the question whether the 0.5 duration is just needed to form (short-term) memory (pp. 59-67) will not contradict the discussion in this paper. Libet confutes the argument: "the 0.5-sec duration of

activities required for awareness is simply a reflection of the time it takes to produce the short-term memory trace of the event" (p.59). Libet says that the same delay is also reported even in the case of a patient who has removed both the hippocampal structures surgically, which are said to be needed to form explicit memory, and, if so, it is against the memory argument. Libet also says that even the patient keeps memories before the surgery. Accordingly, the search in IW will be conducted normally even though the patient cannot retrieve memory with awareness. S/he can obtain the responses which are drawn from the experiences in their IW.

People can learn computer skills without the awareness of IW only if they have the actual world, or OW, in front of them. Libet (2004) reports that the patient without both the hippocampi was also able to learn some skills to play a computer game, sitting at a computer, although s/he could not explain explicitly the way s/he had learned. And Libet argues that it must be the implicit type of memory. Because IW is required to recall and manage experiences in our brains beyond *space-time*, people do not need the awareness of IW to learn something on the basis of *here and now*, only if they have the sights in front of them. It might be for this reason that it is difficult for us to notice the existence of IW.

The retrieval in IW

The retrieval in IW is the process of restructuring memories, and the ways of responding to stimuli and scenes are to give meanings to them on the basis of accumulated experiences, or IW. Saito (2013) says that the retrieval is characteristically the active processes of reconstructing memories in our brains. In other words, one of the prerequisites for awareness is the search in IW. Through the searches, the stimuli must be given meaning in comparison with memory. If necessary, some stimuli are treated with awareness in the end.

If the delays are attributed to the searches and the reconstructions in our IWs, a kind of fan effect would be presumed for the difference mentioned above between the voluntary acts without preplanning (about -400 msec) and those with preplanning (about -900 msec). Jinchō (2004) mentions the fan effect and says that, as regards items to which plenty of information is attached, the related information can be memorized rapidly but it takes longer time to recall them. The other way around, the fact will support the discussions in this paper.

The problem of free will

Free will can be actually felt even if awareness is delayed or is not developed. Although some responses and activities are unconscious, human beings can really experience free will because the responses and activities have been previously prepared in our IWs. They are using the responses and activities which have been *decided* or *simulated* approximately in their IWs.

Sato (2009) discusses affect. The emotions, which usually go with acute responses, are preparatory stages to the adaptive behaviors that are observed with the stimuli which are judged to be the ones that need to be responded somehow. And the moods are to be afterimages of the adaptive behaviors in our IWs and function as facilitators for the memory judgment system in the brain. In other words, all the experiences are the constituent elements of IW and are the bases of our behavior. IW can store a diverse repertoire of behavioral patterns because it is a copy of the real world, or OW, in our brains.

Conclusions

Many topics have been discussed on the basis of the model of language system in the brain. As a result, the discussion leads to the hypothesis that IW is to exist in the brain. When the discoveries reported and discussed in Libet (2004) are studied through the hypothesis, it is comprehensible that all the things, such as the discoveries of Dr. Libet, free will, what we really feel about the mind, and what seem to actually happen in the brain, must be consistent with each other.

In Libet (2004), the same question is repeatedly asked on the function of awareness. As it is obvious through the discussion in this paper, awareness is needed for a human being to check, manipulate and modify their own IW. Human beings act in the actual world in accordance with their own IWs. IW is the basis which maintains the responses and activities in OW. It is changing appropriately and constantly in the brain.

The discussion in this paper seems to confirm the existence of IW in the brain afresh.

Notes

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