No 29 Benjamin Libet (I) (1916-2007)

Gerald Foley CTC 11 February 2014

1. Today I want to look at an American scientist, Benjamin Libet, who was born in 1916 and died in July 2007, at the age of 91.
2. Libet first came to attention in 1985 when he published the paper on which his scientific reputation rests. It was called *Unconscious cerebral initiative and the role of conscious will in voluntary action*.[1] This created a lot of interest among neuroscientists and was quite controversial among a wider public because of what it had to say about free will.
3. The paper also struck certain chords in the AT community and the late Chris Stevens, who was running a training school in Denmark at the time, put on a workshop in Aarhus which was attended by Libet himself. Walter Carrington and John Brown went there from here. Libet also presented his paper at a workshop run by AmSAT in 1988.
4. I have not been able to find any reports on these workshops apart from a short paper on the American one by an Alexander teacher called David Sheppard.
5. Libet had some Alexander work from Walter Carrington and from David Sheppard but he does not seem to have seriously engaged with the Technique like Raymond Dart or Nikolaas Tinbergen did. I have found no mention of the Technique in any of Libet's published work I have read.
6. Nevertheless one sees quite a few references to his work in various publications by AT people. He also gets mentioned on various AT websites as one of the scientists whose work supports the AT.
7. He produced a book called *Mind Time: the temporal factor in consciousness*[2] in 2004 which sums up his life's work. He was eight-eight when it was published and I am all in favour of people of advanced years producing books. But I do have to admit that this it is not really very good.
8. I might also mention that one of the people who has taken some aspects Libet's neuroscientific work forward is Professor Patrick Haggard, of the Institute of Cognitive Neuroscience and Psychology in University College, London.

---

[1] Libet (1985)

[2] Thompson (2005)

9. He gave a couple of talks to Alexander teachers and trainees in Lansdowne Road. I also went to a lecture he gave in the Royal Institution where he discussed some aspects of Libet's work. But as far as I know has stayed clear of any involvement with the AT like having lessons or doing research into it.

10. So who was Benjamin Libet? He was born in 1916 in Chicago of Ukrainian Jewish parents and his father and grandfather were tailors. But he did well in school and went to the University of Chicago where he got a PhD at the early age of 23. It was for studies on the electro-physiological activities in the isolated frog brain.

11. After he got his PhD he had various short-term university appointments and finally joined the University of California in San Francisco in 1950. He became Professor of Physiology and stayed there for the rest of his working life.

12. Nowadays, there are various ways in which brain activity is monitored. We have PET scans, CAT scans, MRI scans but when Libet was doing his research the only way of measuring brain activity was by attaching pads to the outside of the skull and detecting the electrical activity going on in the brain . The equipment for this is called an electroencephalograph, EEG and it is still used to measure brain activity.

13. But Libet got lucky because he became friendly with a well-known neurosurgeon at the University of California called Bertram Feinstein in 1958. Feinstein was a pioneer in what is known as stereotaxic neurosurgery. In this, three dimensional images of the brain are used to guide a very thin probe to kill off brain cells in certain areas to relieve Parkinson's disease.

14. This is now one of the standard treatments for Parkinson's – though they don't destroy the brain cells. They put the probes into the brain and they implant a controller and a battery in the chest. This sends little pulses of electricity deep into the brain which reduces the tremor. The same technique is used for the relief of intractable pain.

15. One of the odd things about the brain is that though it enables us to feel pain, it does not feel pain itself. If you have a hole in your head, it is likely to hurt you but this is because of the nerves in the scalp and the meninges – the covering of the brain – but the brain itself does not hurt. So if you apply a local anaesthetic to the skull, the person can be perfectly conscious and feel no pain when a probe is deep in the brain.

16. As well as sending electric current into the brain, these little probes can be used to measure what is going on in the brain. Feinstein offered Libet the opportunity to devise experiments which would take advantage of these probes in the brain – with the consent of the patients. The collaboration between them went on until 1978 when Feinstein died of cancer.

17. The question Libet was interested in researching was consciousness. He wanted to know:

> *How can the physical activities of nerve cells in the brain give rise to the nonphysical phenomena of conscious subjective experiences, which include sensory awareness of the external world, thoughts, feelings of beauty, inspiration, spirituality, soulfulness, and so on?*[3]

18. In this, Libet, as a neuroscientist, was well in advance of his time. Studies of consciousness or awareness were not regarded as a proper subject for real scientists at the time he was working. This was because they relied on subjective reports rather objective scientific measurements.

19. It was a unique – and probably unrepeatable - opportunity for research into the functioning of the brain and its relation to consciousness. Even though the patients gave their full consent to what was happening, I doubt if any hospital ethics committee or insurance company would permit experiment like these nowadays.

20. What scientists knew at the time was that if you stimulate a particular part of the body, a little electric current can be detected in the somatosensory cortex part of the brain.

21. Libet explored this in detail. He found that when a stimulus is applied to say, the skin of the thumb, the first sign of electrical activity in the brain occurs in 15-20 ms – a millisecond is a thousandth of a second – so the signal reaches the brain in between one and a half and two-hundredths of a second.[4]

22. But Libet found that it was only when the brain has been active for half a second that the person becomes aware of the stimulus. This does not mean that the stimulus had to last for half of a second. It could be just a single pulse but it was only after the brain had been digesting it for 0.5 sec – or a bit less if

---

[3] Libet (2004)p3

[4] Ibid.47

it was a very strong stimulus - that there was a conscious awareness of it.[5]

23. So we can say there are two kinds of response to a stimulus applied to the skin in a particular part of the body. The first and the quickest is the unconscious one. The stimulus is received by the brain and the muscular response is activated without any conscious awareness

24. In practical terms, this means that if a fly lands on my face, there is an electrical response in my brain in about two hundredths – a fiftieth of a second – and I may automatically brush away the fly without it ever coming into my consciousness.

25. Or if I put my finger on something hot, the brain registers the signal and my muscles pull my finger away before I am aware of anything.

26. The other kind of response occurs when a fly lands on my face or I put my finger on something hot and I notice it, which takes about half a second. I can then decide to do something about it or I may decide to do nothing about it.

27. These findings help explain a variety of things. Take the runners in a sprint race. If you time them, you find they are leaving their blocks in just 100 ms, a tenth of a second, after the starter's gun.

28. This is the time for the auditory signal received in the ears to travel to the primary auditory area of the brain, to be processed, sent off to the motor cortex and for the running muscles to be activated.

29. This is well below the time required for conscious awareness of even a strong stimulus like the starter's gun.[6] If you wait until you know you have heard the sound of the gun, the other runners will be well out of their blocks in front of you.

30. So a great deal of a sprinter's training is about developing the ability to respond to the sound of the starter's gun without any conscious thought. This leads us into the discussion on reflex and habitual actions which we will get into another day.

31. You might wonder why we have this two-speed response system: rapid unconscious and slower but conscious. It is, in

---

[5] Ibid.50

[6] Ibid.34

fact, extremely important for the speed and efficiency with which the overall body works.

32. It means that the response of the body to the majority of stimuli can be handled by the reflex system, or by learned responses which are triggered at an unconscious level, without bringing the whole brain into it.

33. As well as being quick, this two-speed responsiveness of the brain is economical in its use of its processing power.[7] Once we become consciously aware of something, far more of the brain becomes involved. We start making choices on how or whether we should respond to the particular stimulus. Shall I brush away the fly or shall I practice inhibition?

34. If we had to make conscious decisions about everything that our senses told us, even the huge computing power of our brain would be unable to deal with it all.

35. Let us now I imagine I am walking along the pavement. My eyes and ears are transmitting signals to my brain but I am thinking about keeping my neck free.

36. At the same time, I am managing the changes and level in the footpath, dodging round lampposts and avoiding stepping into the various bits of dog mess, all without conscious awareness.

37. But every now and again out of the noise of the traffic and all the rest that is going on, one of these passing stimuli is unconsciously selected by my brain as more interesting. It might be a hole in the ground, an unusually big dog mess, or someone calling my name.

38. Libet gives the example of a driver seeing a child step into the road. Responding automatically, we can slam on the brakes in 150 ms.[8] The conscious awareness of the child stepping into the road takes about three times as long. Normally the brakes are on before we are conscious of seeing the child.

39. Libet does not say how the brain decides to select any particular stimulus. He just says that it is perhaps *"the attention mechanism"* that does it.[9] But adds that

---

[7] Ibid.115

[8] Ibid.91

[9] Ibid.115

We don't yet know what brain mechanism "decides" to focus attention on one signal and not the others.[10]

40. However it may be, about half a second after the attention mechanism has selected the stimulus it registers in my awareness and I respond to it by avoiding the hazard or looking round to see who had called me.

41. I personally don't find the idea that our conscious awareness of things is slightly delayed particularly difficult to deal with. Everything takes time to happen.

42. But it is a major issue for Libet.

> *If we look at some of the ramifications of our findings for a delay in sensory awareness, the implications are quite astounding…What we become aware of has already happened about 0.5 sec earlier. We are not conscious of the actual moment of the present. We are always a little late. If that is so, how can one explain the fact that subjectively we feel that we are aware of the actual moment of a sensory event.*[11]

43. He calls it a *strange paradox* that

> *Neural activity requirements in the brain indicate that the experience or awareness of a skin stimulus cannot appear until after some 500 ms, yet subjectively we believe it was experienced without such a delay.*[12]

44. He proposes what he calls *a rather outrageous hypothesis* to deal with this problem. He envisages that somehow the mind manages a backward referral in time to account for this.

> *The sensory experience is automatically and unconsciously subjectively referred backward to the time of the first, fast cortical response to the sensory signal.*[13]

45. If we go back to our sprinters taking off at the sound of the starter's gun, he means by this that the competitors in the race think they were aware of the gun when they sprang out of their blocks but in fact they are responding automatically to the direct

---

[10] Ibid.102

[11] Ibid. p70

[12] Ibid.72

[13] Ibid.79

cortical stimulus, with the conscious awareness coming a fraction of a second later.

46. Libet then asks the question how exactly the brain manages to do this backward referral and finds he has no answer to this.

47. He says:

> *There appears to be no neural mechanism that could be viewed as directly mediating or accounting for the referrals.*[14]

48. In other words, it is a complete mystery. Another way of looking at it is to say that Libet has produced a non-answer to a non-problem.

49. This, I regret to say, is something you will notice about Libet as you read him. His direct experimental results are often very interesting but he has a tendency to introduce complications which he does not deal with very satisfactorily.

50. This phase of Libet's work which ended in 1978 when his neurosurgeon friend Bertram Feinstein died. It is covered in the first half of the book *Mind Time.* In the next talk I will tell you about the next stage in Libet's work which is covered in the second half of the book – and why it attracted so much – and I would say misguided – attention in the AT world.

51. He begins it with the chapter entitled: *Intention to act: do we have free will?*

References

B. LIBET (2004) *Mind time: the temporal factor in consciousness* - Harvard University Press, Cambridge, Mass.
B. LIBET (1985) *Unconscious cerebral initiative and the role of conscious will in voluntary action* - The Behavioural and Brain Sciences 8 529-566.
G. W. THOMPSON (2005) *The placebo effect and health: combining science and compassionate care* - Prometheus Books, Amherst NY

[14] Ibid.85