

No 15 Sir Charles Sherrington (1857- 1952) (II)

Gerald Foley

CTC

7 October 2014

1. In the last talk, I gave you a short biography of Sir Charles Sherrington. There is no doubt whatsoever about his eminence as a scientist and his importance in the development of neuroscience.
2. You may have noticed that, by coincidence, there was an article by John Nicholls on *Explaining the Alexander Technique* in the last issue of STATNEWS which mentions the pioneering work of Sherrington. He says of it:

*Wonderful work in its time, but like all scientific work, others build on it, extend on it and find flaws in it.*¹
3. We can obviously say the same things about Alexander's work. Like that of Sherrington, it is up us to build on it, extend it and find flaws in it.
4. I also got the paper by Jean Massion to which John Nicholls refers. It is called *Why and how are posture and movement coordinated?* It is quite a technical paper for those who want to get into mathematical modelling of the movement of the human body. It is a bit outside our immediate interests but anyone who wants can have a look at it here and decide whether they want to get it.
5. The same is true of Sherrington's enormous output of detailed technical papers which is by and large outside our competence and interest though I am not aware of any major flaws in his work and it still underlies the way modern neuroscientists see the world.
6. For me it is in his broader thinking, where he often goes well beyond the normal boundaries of neuroscience, that his main interest for us lies.
7. One of the most accessible sources of this broader thinking is a very elegant and not-too-technical lecture called *The brain and its mechanisms* which he gave in Cambridge University in 1933.
8. He was seventy six and coming up to retirement. This is quite a reflective talk in which he is meditating on his fifty years of experimental work and putting it into a broader and more philosophical context.

¹ Masion (2004)

9. It was published as a booklet which is long out of print but I managed to get hold of a copy of it from a bookshop in New Zealand through ABE books. It is quite short and gives a very good flavour of how Sherrington looked at the world. I have given a copy to the library.

10. It is full of thought-provoking observations. I liked this as a comment on how the brain connects us with the external world:

Inside the animal's form sits the brain, its work broadly to increase the animal's grip on the world about it, and hardly less the grip of the external world upon the animal.²

11. Here is a nice observation AT-flavoured on how the head leads us onward in space and time:

That leading end, the head, has receiving stations signalling from things at a distance, things which the animal in its forward movement will next meet. A shell of its immediate future surrounds the animal's head.³

12. After he retired, he produced a book called *Man on his nature*⁴ which was first published in 1940 when he was 83 and revised in 1951 when he was 94.

13. This is much more philosophical than *The integrative action of the nervous system* and traces the way philosophers and scientists have thought about the relationship between the mind and the body from Aristotle onwards. If you are interested in the work of modern neuroscientists and philosophers in this area, it is interesting to see how little they have advanced beyond what Sherrington was saying in the later chapters of this book.

14. But for now, I want to narrow in on things which are of much more direct concern to us as AT teachers. The first of these is what he had to say about the overall workings of the nervous system, especially the importance of the reflex system and the question of posture.

15. If we look at the vertebrate nervous system, we have the brain at the top with the spinal cord carrying nerve impulses to and from it. Between the vertebrae, there are gaps out of which sensory and motor nerves emerge and serve the sensing and moving bits of the body.

² Sherrington (1933)p6

³ Ibid.15

⁴ Sherrington (1951)

16. There is a high degree of decentralisation in the working of the nervous system. A lot of the functioning of the body involves just the sensory and motor nerves at a particular level in the spinal cord. These elements of the body, controlled by nerves emerging from the spinal cord, are called segments.
17. Really simple physiological responses, the little twitch you see on an animal's back when a fly lands on it, just involve a single segment and there is no need for headquarters, the brain, to be involved.
18. But in normal daily activity, things are much more complicated. If I am standing up and I move my arm for example, this has implications for the muscles of my back, the angle of my head, the position of my eyes in their sockets, the weight distribution on my feet, and so forth.
19. The nervous system deals with this by having lines of communication that run up and down the spinal cord, allowing segments to communicate with each other, and all of them to communicate with the brain.
20. But when I say brain, we need to stop and look at that in a bit more detail.
21. Immediately after the spinal cord enters the skull, it swells out into what is called the brainstem. Above that we have what is usually thought of as the brain itself, otherwise known as the cortex, where thinking takes place. It is the home of consciousness and the centre of conscious control.
22. The really interesting thing from an AT point of view is how much of our daily activity is controlled by the brainstem without involving the cortex. This is what we call reflex action.
23. A reflex is an automatic inbuilt muscular response to a stimulus. It cuts out any activity on the part of the cortex. This is the subject of a great part of Sherrington's *The integrative action of the nervous system*.
24. He is particularly interesting on the question of posture. He points out that it is an active and highly complex process that happens reflexly. He says:

...much of the reflex reaction expressed by the skeletal musculature is postural. The bony and other levers of the body are maintained in certain attitudes both in regard to the horizon, to the vertical, and to one another...Innervation and co-ordination are as fully

*demanded for the maintenance of a posture as for the execution of a movement.*⁵

25. It was this interest by Sherrington in the question of posture that inspired Rudolph Magnus to carry out his monumental study on *Animal Posture* which I will have plenty to tell you about later.
26. But the separation between the reflex and conscious is not by any means total. Sherrington says of the reflex system that it is
*...within the control, to a certain extent, of the reactions of the brain. This mastery of the brain over the reflex machinery does not take the form of intermeddling with reflex details; rather it dictates to a reflex mechanism 'you may act' or 'you may not act' The detailed execution of the motor act is still in immediate charge of the reflex.*⁶
27. Take the example of my making a decision to raise my left arm. The way Sherrington sees it, the decision is made by the conscious brain. But all the other adjustments that happen are automatic or reflex.
28. But it is more complicated than that. We also have to deal with the question of habit. Habits are acquired a result of training: either deliberate practice or unconscious imitation. Once we have a habit, we do it without thinking when the necessary stimulus occurs. In that sense habits are very similar to reflexes.
29. When I was growing up, men almost always wore hats and the custom was to raise the hat slightly on passing a catholic church. In Sligo, the main church, the Cathedral, had a clock. So as men went past, they raised their hats and glanced at the time.
30. It so happened that the Post Office in another part of the town, also had a clock and I remember my father pointing out to me how many men glanced at the Post Office clock and raised their hats. This was pure habit – it could also be called a kind of “conditioned reflex”.
31. Habit has a profound influence of everything we do. Given that our earliest influences are our parents, and especially our mothers, a lot of our behaviour, like the way we walk, sit, hold ourselves is a result of habits we have acquired from our parents.

⁵ Sherrington (1906)339

⁶ Sherrington (1946)p88

32. So even when we do something simple like standing still or raising an arm, we are unaware of the huge amount of neuromuscular activity that goes on in our body. This includes the reflex activity, the way habit comes into play, and perhaps an overlay of trying to do what we think is the right way of going about it – what Alexander called “end-gaining”.
33. A lot of the things we do in our games are related to disentangling these aspects of our behaviour. One of the clues we rely on when we are examining with our pupils, or ourselves, how we do these simple acts, is the degree of tension in the muscles. When we are allowing our natural reflex systems to take charge, the tensions are at a minimum – as one might expect.
34. It is when we are “doing” our standing either deliberately or in accordance with some habit we have acquired or trying to be correct that the muscles tend to be tighter. So getting ourselves into a balanced state in which our muscles are doing the minimum is a good start.
35. All this business of allowing, not pulling down, not tightening, is a way of mobilising our reflex systems to do their job.
36. This, however, brings us to a point that we need to be aware of when we are reading Alexander. He did not give the reflex system the recognition it deserves. He saw it as something belonging to our primitive past rather than an integral part of what we are.⁷
37. We can see this clearly in *The universal constant in living* where he includes a quotation from Sherrington which says:
- Take this act of “standing”. Suppose my mind’s attention be drawn to it, then I become fully aware that I stand. It seems to me an act fairly simple to do. I remember, however, that it cannot be very simple. That to execute it must require among other things the right degree of action of a great many muscles and nerves, some hundreds of thousands of nerve fibres and perhaps a hundred times as many muscle fibres...When (my brain) gives its attention to my standing it can make me fully aware that I am standing, but as for telling me*

⁷ There is a detailed discussion of this in the paper Alexander and Evolution (<http://www.geraldfoley.co.uk/ALEXANDER%20AND%20EVOLUTION.pdf>)

*how I stand or as to helping me analyse my standing, I get extremely little from it.*⁸

38. Alexander is rather scathing about this observation and says that despite Sherrington's knowledge of the working of the nervous system

*...his conception of what was required for a full study of the central nervous system could not have been a comprehensive one, because the knowledge he had acquired through this study did not help him meet a need that he had assumed his mind would enable him to meet.*⁹

39. He goes to say that this was because Sherrington had not learned about:

*...the "means whereby" of the direction and despatching of the messages through the nerve fibres and the registering and adjusting of pressures and tensions throughout the organism – the "all this" – which results in the act of "standing."*¹⁰

40. There is obviously quite a gulf between the two men. Alexander's non-recognition of the reflex system led him into an over-optimistic view of how much of the body's activity can be brought under conscious control, while Sherrington was pessimistic about how much we can bring into consciousness about the workings of the body and its reflex systems.

41. Nevertheless, in his last book *The endeavour of Jean Fernel*, published in 1946 when he was 89 and increasingly crippled with arthritis Sherrington openly acknowledged Alexander and revealed how well he understood what he was getting at. It is a tantalising glimpse of what might have been if he had had personal hand-on experience of the Technique.

42. Next time I will tell you more about it.

References

- F. M. ALEXANDER (1946) *The universal constant in living* - Mouritz, London (2000 edition)
J. MASSION, A. ALEXANDROV, A. FROLOV (2004) *Why and how are posture and movement coordinated* - Progress in Brain Research Vol 143 13-27
C. SHERRINGTON (1933) *The brain and its mechanism* - Cambridge University Press, Cambridge

⁸ Alexander (1946)p117

⁹ Ibid.p119

¹⁰ Ibid.p119

- C. SHERRINGTON (1946) *The endeavour of Jean Fernel* - Cambridge University Press, Cambridge
- C. SHERRINGTON (1906) *The integrative action of the nervous system* - Cambridge University Press, Cambridge (1948 edition)
- C. SHERRINGTON (1951) *Man on his Nature* - Cambridge University Press, Cambridge