

No 14 Sir Charles Sherrington (1857-1952) (I)

Gerald Foley

CTC

(revised) 26 January 2016

1. Today I am going to talk about Sir Charles Sherrington (1857 - 1952). He is by far the biggest scientific name to have publicly endorsed the Technique. If only for that we should know something about him.
2. But I also think that if we are looking for a neuroscientific picture of what goes on the Technique, there is no better starting point than his work. If we can understand Sherrington – I don't mean in full detail but in the broad picture he paints of the working on the human nervous system – we have a foundation on which we can build a scientific understanding of the Technique.
3. Sherrington is acknowledged as the founder of modern neuroscience. Apart from making some the key discoveries which underpin our understanding of the nervous system, he was also its greatest synoptic thinker. In addition to producing all kinds of detailed insights, he also had a concept of how the overall system worked. This, of course, is of particular interest to us as AT teachers.
4. I read an article in the *New Scientist* where someone was talking about how science, as it progresses, tends to look at things in ever greater detail. This is fine but it must not lead to us losing sight of the larger framework within which the subject of our investigations sits.
5. The writer gave the example of a scientific examination of the score of a symphony. If we simply examine the molecular composition of the ink and the paper this will not tell us anything whatsoever about the music
6. If we are looking at the neurophysiology of the human organism, in addition to the workings of the neurons and the neurotransmitters, the mirror neurons and all the rest of it, we need to be aware of the working of the overall neuromuscular system. Sherrington had the capacity to see the detail and the overall picture.
7. As usual, I will tell you my sources, so any of you who want to take things further can do so. There is plenty on the web if you just put Sherrington's name into Google. There is also quite a nice summary biography if you look him up on the Nobel Foundation website. The simplest way is to go to www.nobelprize.org and type in Sherrington.

8. A couple of his colleagues and students have produced books about him. One of the best is *Sherrington: his life and thought* by Eccles and Gibson. Both were students of his and went on to have distinguished careers of their own, with Eccles winning the Nobel Prize in 1963 for his work on synapses.
9. Another highly accessible book called *Charles Scott Sherrington: an appraisal* by the Finnish scientist Ragnar Granit was published in 1966.¹ Granit was one of Sherrington's students and received his own Nobel Prize in 1967 for his work on the physiology of the visual process.
10. Sherrington himself was extremely prolific. He wrote 320 scientific papers of which a 500 page summary was published in 1940. He wrote a number of books to which I will be referring, of which *The Integrative Action of the Nervous System*, published in 1906 is the most famous and the most important.
11. Sherrington and Alexander grew up in the middle of the 19th century. But their background and early life were extremely different.
12. Sherrington was born in London in 1857 twelve years before Alexander. His father died when he was a small child and his mother remarried a well-known classical scholar called Dr Cabel Rose who lived in Ipswich. Rose was also a notable geologist, archaeologist and art collector.
13. The family home in which Sherrington grew up, in contrast with the Alexander farm, was a meeting place for writers, poets, artists and scientists. His secondary education was at the very old and famous Ipswich School where he had the typical upper-middle-class education of the time. His subjects included Latin, Greek, history and literature – but no science.
14. His home background and education meant that though Sherrington was later to excel in science he was also very good at languages, wrote poetry, was interested in art, collected rare books and was generally a deeply cultured individual.
15. He was also very good at sports. Even though he was quite small and generally rather diffident he was apparently a quite aggressive rugby player and one of the pioneers of winter sports in Switzerland. He also played football for Ipswich Town.
16. He intended going to Cambridge University but, striking a contemporary note, one of his biographers said

¹ Granit (1966)

*A bank failure so crippled the family's finances that Charles enrolled at St Thomas's Hospital Medical School in order to permit his brothers William and George to go up to Cambridge ahead of him.*²

17. While waiting to go to Cambridge – I suppose you could call it his gap year – instead of backpacking in Thailand, he began to study at the Royal College of Surgeons and also enrolled as a medical student in St Thomas's Hospital in London in 1876. In 1879, he made it to Cambridge where he studied Natural Science and Medicine.
18. In 1881, when he was in his second year at Cambridge, he attended a medical congress in London at which the working of the nerves was discussed. One of the speakers was a German physiologist called Friedrich Goltz who had been working on the nervous system in dogs and had produced some controversial ideas.
19. It was one of the key moments in biological science. Sherrington became very interested in the questions Goltz was raising and started working on them in Cambridge. His first published scientific research paper was in 1884.
20. He qualified as a member of the Royal College of Surgeons in 1884 and obtained a medical degree from Cambridge in 1885. He was quickly appointed lecturer in physiology in St Thomas's Hospital and got a research fellowship in Cambridge.
21. A few years later, in 1891, he became the Physician-Superintendent of an animal research centre called the Brown Institution which was a rather neglected little outpost of the University of London.³ In the four years he spent there, he continued to produce scientific research papers and according to Eccles and Gibson, *"to build the foundation on which modern neurology is based."*⁴
22. Because of the high quality and originality of these papers his scientific reputation grew steadily. He became a Fellow of the Royal Society in 1893.
23. He was appointed Professor of Physiology at Liverpool University in 1895. During the next ten years, there was a flood of high quality scientific papers from his laboratory in Liverpool.

² Eccles and Gibson (1979)p1

³ Cohen (1958)p7

⁴ Eccles and Gibson (1979)p5

24. Because of his growing scientific fame, he was invited to give a series of six lectures in Yale University in 1904. These were published in 1906 as *The Integrative Action of the Nervous System*⁵. This book discusses how the nervous system coordinates the activity of all the body's muscles and is widely regarded as the founding document of modern neuroscience.
25. In 1913, he was appointed Professor of Physiology at Oxford and remained there until he retired in 1936 at the age of 79.
26. He was elected President of the Royal Society in 1920. That is as high an honour as you can get in British science. He was awarded the Nobel Prize in 1932. He became Sir Charles Sherrington in 1922.
27. Even after he retired, Sherrington remained intellectually and professionally active and he published a book called *Man on his Nature*⁶ in 1940 when he was 83. This is based on a series of guest lectures called the Gifford Lectures which he gave in Edinburgh University. This book is less technical than his earlier books and in many ways it summed up his life's work while putting it in a broader philosophical and historical context.
28. He was especially interested in the life and work of a famous 16th century French physician called Jean Fernel (1497-1558) whom he saw as a key figure in the early emergence of the scientific attitude. Fernel, for example, was far in advance of his time in abandoning astrology. The *Daily Mail* remains in the pre-Fernel age and still publishes astrological charts and forecasts.
29. Sherrington's last book, which was published in 1946, when he was 89, was a life of Fernel and was called *The Endeavour of Jean Fernel*. This is a formidable work of scholarship for an old man, involving researching original manuscripts in Latin, Old French and other languages.
30. But he was not quite finished his professional activity. *The Integrative Action of the Nervous System* was published in a new edition in 1947 as a tribute to him on his 90th birthday and a copy was presented to every delegate at the XVII International Congress of Physiology in Oxford that year.
31. Despite his age, Sherrington wrote a long new introduction to the book which showed how little the intervening forty years had dimmed his interest and intellectual capacities.

⁵ Sherrington (1906)

⁶ Sherrington (1951)

32. Through all this research, he was also interested in wider issues, particularly to do with science and education. In 1916, he was urging that women be admitted to the medical school in Oxford.
33. During the 1st World War, he was asked by the War Office to produce a report on fatigue among armaments workers. The best way to research that, he decided was to go to work in a factory himself. So he spent the three months of the summer vacation from Oxford as an ordinary worker in the Vickers-Maxim shell factory in Birmingham.
34. He worked seven days a week, from 7:30 am to 8:30 pm, with early days off at 6:30 pm on the weekends and lived in a workman's hut. His report said shorter hours and better living conditions gave greater productivity. He was speaking from experience.
35. He was pleased that his foreman in the factory told him he could mention his name if he ever needed a reference.
36. There is absolutely no doubt about Sherrington's place in the development of neuroscience. At the first International Congress of Neurology in Switzerland in 1931, when he was introduced,
- ...the whole audience of 2000 members stood and cheered unceasingly until Sherrington, overcome with emotion, signalled them to be seated.⁷*
37. But also, every account of him at a personal level, describes him as altogether an engaging, modest, generous, friendly and cultured person. He published a book of poetry called *The Assaying of Brabantius* in 1925.
38. I will now try to give you some idea of his work. The main focus was on the nervous system in vertebrates, and especially the workings of the reflex system. Starting in the 1890s, he made a variety of fundamental discoveries.
39. These were all based on detailed laboratory work. Right to the end of his research career, he was renowned as a meticulous and ingenious laboratory experimenter.
40. At the time, he was beginning his research, many scientists believed the nerves in the body formed an interconnected web or network along which nerve impulses flowed.

⁷ Cohen (1958)p13

41. But from his experimental results, Sherrington worked out that nerve cells, to which he gave the name neurons, could not be directly connected with each other. There had to be a separation to which he gave the name “synapse”, across which nerve cells communicated chemically with each other.⁸
42. This insight of Sherrington’s was fundamentally important to understanding the working on the nervous system. It later led on to the science of neurotransmitters - substances with names like dopamine, noradrenalin and serotonin – which carry nerve messages across synapses.
43. He studied proprioception – the way the body knows what is going on inside itself. He did a lot of the basic work on muscle spindles which detect the amount of stretch in muscles.
44. He had very interesting things to say about inhibition, by which he meant the process by which the nervous system stops or prevents the activity of muscles.
45. An example of inhibition in Sherrington’s sense, is the way the nervous system automatically inhibits the action of the opposing muscles when we activate particular muscle groups. If I flex my arm, the muscles on the other side automatically relax.
46. This is known as Sherrington’s Law or the law of reciprocal innervation. This inhibition is reflex; it happens automatically. But of course we can override the reflexes and bend our arm while holding it quite stiff.
47. Apart from his detailed laboratory work, the other side of Sherrington’s achievement was in the way in which he was able to build up an integrated picture of the neurological working of the vertebrate animal – of which we are an important example.
48. Reading Sherrington, as AT teachers, we find that as we come to understand it, his work illuminates what we do in a variety of ways. It helps us understand what is happening in ourselves and to describe it in ways which are more easily communicated to scientists and medical people.
49. But there are also some closer and more direct links between the AT and Sherrington. I will tell you about them the next time.

REFERENCES

COHEN, Birkenhead (1958) *Sherrington: physiologist, philosopher and poet* - Liverpool University Press, Liverpool

⁸ Granit (1966) 43

- J. C. ECCLES, W. C. GIBSON (1979) *Sherrington: his life and thought* - Springer-Verlag, Berlin
- R. GRANIT (1966) *Charles Scott Sherrington: an appraisal* - Thomas Nelson and Sons, London
- 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