

No 13 Reflexes

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1. The last two talks were about Margaret Naumburg, the progressive educationalist and woman of many parts who introduced Alexander the philosopher John Dewey.
2. Dewey was a major influence on Alexander and played an important part in promoting the Technique among prominent academics and people of influence in the US. He also had some things to say about the scientific nature of the Technique which are just as relevant as they were 65 years ago.
3. I am now going to look at some prominent scientists who in various ways have connections with the Technique. The first three of these are Sir Charles Sherrington, Rudolph Magnus and George Ellett Coghill, all of whom Alexander mentions in his books and were important to him in different ways.
4. But before getting on to talking about these scientists, and how they figure in the story of Alexander, I want to say a few words about reflexes. It is a term which figures particularly largely in the work of both Sherrington and Magnus and is highly relevant to our understanding of the working of the Technique.
5. It is also a term over which there is quite a lot of confusion even in scientific circles. In broad popular terms it has come to mean something that we do quickly and automatically. But when I was looking for a precise scientific definition of the word reflex, I came across a scientific paper written in the year 2000. It is called *What do reflex and voluntary mean? Modern views on an ancient debate*.
6. This discusses the question in considerable depth and concludes by saying that "*present-day researchers still cannot reach a consensus on what exactly the words reflex and voluntary actually mean.*"¹
7. So if you find you are occasionally a bit confused when trying to figure out what different people mean when they are talking about reflexes, you are in good company. The fact is there is no absolutely correct definition of the word reflex which is accepted by everyone. Different people use it to mean different things.

¹ Prochazka (2000) 417

8. Because of this, Walter Carrington used to caution us about using the word reflex when we are talking to pupils about our work. But provided we know what we mean, and can explain to our pupils or fellow teachers what we mean when we use it, I see no reason not to use it with discretion.
9. So what I am going to do is give you some few illustrations of how different people use the word reflex. This will give some idea of the spread of meanings. And then I am going to go into some detail about how it is used in the work of Sherrington and Magnus.
10. In general non-scientific use, the word reflex usually means a very quick unthinking reaction. When a person reaches out quickly to stop their pint of beer falling, or someone suddenly slams on the brakes in a car to avoid an accident, we often say they showed quick reflexes. But really we are just saying they responded quickly to the situation.
11. We get very interesting and extreme examples of quick reactions in certain sports. A goal-keeper saves a point-blank shot at goal. Top tennis players are able to return a hundred-mile-an-hour service, or sprint athletes are able to get out of their starting blocks in a tenth of a second.
12. These extremely fast responses are often referred to as reflex actions. For our purposes, they have two distinctive characteristics.
13. One is that no one is born with these abilities. They have to be learned. Some people may be able to learn them more quickly than others but no one is born with the ability to deal with hundred mile-an-hour services.
14. The other is that when these abilities are being put into action at the highest level, they bypass conscious thought. If you start to think about how you are going to do these things, the moment will have passed and it will be too late. The ball will have passed you or the other runners will be ten metres up the track while you're saying to yourself, "*Better do something about this – time I got moving.*"
15. What happens in these cases is that the person spends a lot of time learning how to do these things, hit tennis balls, catch fast-moving footballs, leap out of the blocks at the sound the starter's gun. Eventually, they will have learned whatever it is so thoroughly that it has become completely habitual and can

be executed without any conscious thought. It clicks into action when the signal or stimulus to do it is received.

16. This kind of habitual response which bypasses conscious thought is often referred to as a learned reflex. It happens without thinking but it has to be learned.
17. Then there is the conditioned reflex response made famous by the Russian scientist Pavlov. When a dog sees or smells food, it automatically salivates. This is actually quite a complex reflex response. It involves both glandular activity in producing the saliva and muscular activity in the jaw and elsewhere.
18. What Pavlov did was to associate the sight of food with the sound of a bell or other signal. The bell would ring, the food would be presented, and the dog would salivate.
19. After repeating this procedure a number of times, Pavlov found that the dog began to associate the sound of the bell with the food and would salivate at the sound of the bell. This became known as a conditioned reflex. It is again a kind of learned reflex, since dogs do not normally salivate when a bell rings.
20. The way we are going to be using the term reflex is much more restricted than this. When Sherrington and Magnus are talking about a reflex, they mean an innate or inbuilt, automatic, response to a stimulus.
21. There is no thought involved and it is not learned; it is part of our neurological make-up. Sherrington makes the distinction between habit and reflex action very clear. In one of his books he writes:

*Habit arises always in conscious action; reflex behaviour never arises in conscious action. Habit is always acquired behaviour, reflex behaviour is always inherent and innately given. Habit is not to be confounded with reflex action.*²
22. There are lots of reflexes of this type. The contraction of the iris muscle which contracts the pupil in the eye when a bright light shines into it is one.
23. The pinna reflex is a nice way of teasing a cat. If you gently touch its ear, even when it is asleep, it flicks the ear. This is an

² Sherrington (1906)pxvi

innate response to a stimulus such as an insect landing on the ear.

24. The way a dog automatically scratches its shoulder when it senses something that might be a flea is called the scratch reflex and also happens quite automatically, even when the dog is asleep.
25. One of the most complex and extensive of all reflexes is the startle reflex which involves hundreds of muscles all over the body. When we hear a sudden noise, or something unexpectedly touches or hits against us, especially from behind, we immediately stiffen.
26. This is an automatic protective mechanism which is usually accompanied by rapid breathing and increased heart-rate.
27. Another interesting reflex is the stretch reflex, this is also called the “myotatic reflex” – when you see “myo” in a word it usually means it has to do with muscle. The myotatic reflex is the contraction which occurs in a voluntary muscle when it is stretched.
28. Muscles and tendons have various kinds of sensors in them and when a muscle is stretched, even very slightly, these sensors are stimulated and they send signals to the central nervous system which in turn sends out a signal to the muscle to contract.
29. This is a protective reflex. If someone starts to pull our arm, it tends to tighten up before it is pulled out of its shoulder joint. This effect is also felt in the postural muscles. If I start to go off balance, some of the postural muscles holding the body upright are stretched and the stretch reflex tightens them to stop me going further off balance.
30. The stretch reflex is also what makes the knee-jerk or patellar reflex – the one that happens when the doctor taps just below your knee. The tendon of the big quadriceps muscles in the front of the thigh runs under the patella and attaches into the front of the tibia. When the doctor gives the tendon a little tap, just below the patella, it stretches the quadriceps which immediately responds by tightening and lifting the lower leg.
31. It’s also worth mentioning the word “instinctive” here. It is generally used to mean behaviour which is not learned and happens automatically. In that sense, it is often used as a synonym for reflex but it can be used in lots of other ways.

32. I have even found the expression “instinctive reflex”. Because it can mean so many things, I tend to stay away from using the word instinct or instinctive in relation to our work.
33. So for our purposes, a reflex is an innate, automatic response to a stimulus. A reflex takes place without the involvement of the conscious brain.
34. I now want to give you a little bit of technical explanation about the workings of reflexes, starting with the simplest. When you are browsing through your physiology books, you often sometimes see the expression “*reflex arc*”.
35. The reflex arc is the sequence of neurological connections involved in the simplest of reflexes.
36. At the beginning of the arc, there is the “receptor” cell which is sensitive to an external or internal stimulus. This might be a heat sensor in the tip of my finger, or a touch sensor in the tip of a cat’s ear. This sensor cell is connected by a nerve thread – called an axon – to a type of nerve cell called a sensory neuron, in the brain or the spinal cord.
37. When I put my finger on a hot surface, or something touches against the cat’s ear, a nerve impulse travels from the sensor along the axon to the sensory neuron.
38. This stimulates the sensory neuron to send a signal to another type of neuron called a motor neuron, which sends a signal to a relevant muscle fibre which makes it contract. As a result, the finger tip is pulled away from the hot surface or the cat’s ear is flicked.
39. The diagram is like this: sensory receptor, sensory neuron; motor neuron; muscle fibre.
40. Just for completeness, I should mention that in most cases, there is another neuron, called an interneuron, which acts as a relay between the sensory and the motor neurons.
41. And since I am giving you some technical terms, I may as well mention that nerve impulses which flow from sensors into the central nervous system are referred to as afferent impulses. Those which flow outwards from the brain or the spinal cord to a muscle or a gland are referred to as efferent impulses.
42. I should also say that the simple reflex arc is really a convenient fiction. We never get a simple reflex arc being mobilised on its own. In the real functioning animal, reflexes are always much more complex. The patellar reflex, the startle

reflex, withdrawing your finger from a hot surface, even the pinna reflex involve widespread muscular activity.

43. But with the description of the simple reflex arc in mind, we can see that this is what Alexander was talking about in the section on *Unity and cell functioning* in *The universal constant in living*.
44. Alexander says

*The sensory mechanism receives an impression by means of cell receptors, and this impression is a stimulus to the excitors resulting in a reaction in the form of the production of energy.*³
45. We can see that he has a reflex arc in mind. Here we have the receptor receiving a stimulus, the stimulus being transmitted to the muscle fibre which releases energy through the breakdown of adenosine triphosphate (ATP).
46. If we look at very simple creatures, their activity is entirely reflex. But the more complex the creatures, the more obvious it is that their behaviour goes beyond the reflex and is to a greater or less extent voluntary.
47. In one of his books, Sherrington discusses Descartes' idea of animals as being like automata, devoid of will or intelligence responding only to stimuli. He remarks that this description makes us feel that *Descartes can never have kept an animal pet*.⁴
48. As people with dogs or cats know very well, a lot of the actions of our domestic companions goes well beyond the reflex and quite definitely involve some form of thought.
49. This is where it gets particularly interesting with human beings. Since the muscles which are used automatically by the reflex system are by and large the same muscles that we use when we perform voluntary actions, we have the capacity to interfere with our reflexes in a vast number of ways.
50. In normal life, the reflex system looks after an awful lot of our activity. We stay in balance, we walk, we sit and stand, we blink our eyes, we breathe, we lower our heads to go through a low doorway, all without any thought whatsoever.

³ Alexander (1946)p112

⁴ Sherrington (1906)pxiv

51. But the brain can always intervene to override or interfere with our innate reflex ways of doing these things.
52. This is why the doctor who is going to give you a tap below the kneecap always asks you to relax. If we think about what the doctor is going to do, we tend to tighten up our knee and the tap has little or no effect.
53. This ability to override our reflexes is what gives us our versatility and creativity. It is also what enables us to make such a mess of how we use our bodies.
54. So for the next few talks I am going to be looking at the work of Sherrington, Magnus and Coghill, and how it is relevant to the Technique and the way we think about it.

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