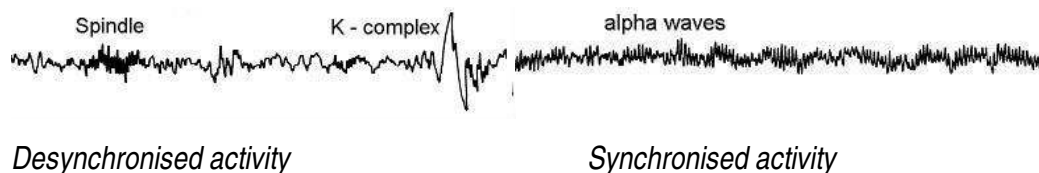


The EEG

The electroencephalograph (EEG) is an apparatus that records electrical activity in the brain. It produces a readout as a line on a roll of paper or a screen. A number of terms are used when describing an EEG readout. When the peaks and troughs on the line are close together, it is described as **high frequency** or **fast**. When the peaks and troughs are more spaced out, it is described as **low frequency** or **slow**.



When the peaks are high and the troughs are low, it is described as a **high voltage** trace, whereas when they are more compact, it is described as a **low voltage** trace. When a repeating pattern is seen in the trace, it is said to be **regular** or **synchronised**. Where there is no repeating pattern, it is called an **irregular** or **desynchronised** trace.



Some brain states produce waves with a characteristic shape, each of which has its own term. Some of these are **alpha**, **delta**, **theta** and **sawtooth** waves. Other patterns that can be detected on an EEG include **spindles** (short bursts of high frequency activity) and **K-complexes** (a single sharp spike in a low voltage trace).

Sleeping, Waking and the EEG

When a person's EEG is taken whilst they are asleep, distinctive changes can be seen at regular intervals. The waking EEG shows irregular, low voltage activity. As the person becomes drowsy, the trace becomes synchronised and alpha waves appear. At this point, they are still awake. When the EEG becomes desynchronised and theta waves start to appear, this is the sign that the person is properly asleep and has entered stage 1. After spending a short period in stage 1, the EEG changes again as the person enters stage 2. The trace now shows slightly higher voltage waves, and spindles and K-complexes appear for the first time. Stages 1 and 2 are relatively light sleep, from which a person can be woken fairly easily.

Eventually, the person moves to stage 3. Slow, high voltage delta waves begin to appear, and the incidence of spindles diminishes. After a short period, the person enters stage 4 sleep, where the EEG shows almost all delta waves. Stages 3 and 4 are deeper types of sleep, from which it is more difficult to wake the person. Together, they are called slow wave sleep (SWS) because of the delta waves on the EEG trace. At various points in the night, the person enters REM sleep. Here, the EEG shows a trace very like that of a person who is awake, except for occasional bursts of sawtooth waves. REM stands for Rapid Eye Movements. This stage gets its name from the fact that the person's eyes begin to dart around quickly during this stage. If you watch a person who is asleep, you can observe this happening by watching their eyelids.