



Understanding the EEG Output

- The colors on the EEG map line up with the colors on the drawing of the brain.
- The red area maps to the occipital lobe, which is at the very back of the brain. This is the area that first begins to process the visual information, providing early perceptual processing – recognition of the images features, colors and shapes.
- The yellow area represents traces from the parietal lobe, where higher-level visual processing takes place, and the basic features and shapes of the image are interpreted as objects such as faces, animals, or weapons.
- The two green areas map to the temporal lobe. The temporal lobe is primarily associated with speech, language and auditory processing, which do not play a major role in these image-based experiments. However, the temporal lobe also does some image processing like the parietal lobe, helping with object recognition. It is also worth noting that the fusiform gyrus (the region of the brain most associated with the specific task of face recognition) is located in the temporal lobe, as is the amygdala – the part of the brain that is believed to control emotional responses. Both of these areas have responses that could come into play in the EEG experiments, but because of the specific location of these two regions, it is hard to isolate their specific responses in any one particular EEG trace.
- The blue area maps to the frontal lobe, believed to be the area of the brain that controls planning, problem solving, and other cognitive tasks.

A few other important things to understand:

You can get a feel for how the signals are propagated through the brain by looking at the timing of the peaks in the various areas. You get the first peaks (at about 150ms) in the occipital lobe. The peaks in the parietal and temporal lobe appear a bit later than that, around 300-500ms. Finally, after what appears to be about 500-700ms, the peaks in the frontal lobe are reaching their maximum. Using this timing information you can reconstruct the basic image processing flow in the brain. The processing begins in the occipital lobe where the basic perception of the image is performed. That information is sent out to the parietal and temporal lobes where it is processed and particular objects and faces are recognized, and finally, that information is fed to the frontal lobe where higher-level cognitive processing of the image (thinking about the image's meaning, making plans based on what you see, things like that) can be done.

It should also be noted that this flow of information is definitely not a one-way path. As the parietal and temporal lobes are performing their tasks, they are sending tons of information back to the occipital lobe to help it to refine its processing. Similarly, the frontal lobe is constantly sending information back to the other three areas to refine their processing as well. This feedback process is part of what allows you to focus in on critical details quickly. For example, the occipital lobe may process an image and send the info to the parietal and temporal lobes. Those lobes might do their jobs and realize that in the image you see a face and a gun. They would send that info along to the frontal lobe and also back to the occipital lobe, perhaps causing the occipital lobe to focus in on the details of the gun. This detailed information could then be processed and the temporal and parietal lobes could determine if it's a toy gun or a real gun and exactly where the gun is aimed, and send that info to the frontal lobe, allowing you to make a decision about exactly how to act.