Capturing "colors"
Development of a neural circuit producing colors

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Neural mechanism to capture "colors"

Even if wavelength components of light radiation vary largely, humans are able to recognize objects' colors correctly. Assume that we illuminate the diagram shown on Fig. 1 from three sources of light only (S: short wavelength, M: middle wavelength, and L: long wavelength). Rectangle A looks green and is located at the center of the diagram on Fig. 1A. It is reflecting light by each of the three sources of 1, 4.5, and 4 (units), respectively. On the other hand, rectangle B appears yellow of 1, 5, and 9 (units), respectively. Now presume that we change the intensity of the light sources so that green rectangle A reflects respectively 1, 5, and 9 (units). Therefore, the light entering our eyes should be the same as the reflected light at the yellow rectangle B. Notwithstanding, this rectangle B still looks green: it never appears as yellow.

Thus even if the characteristics of light coming into our eyes change to a great degree, we retain "color consistency," by which we can recognize the color of an object correctly. That fact indicates that the light itself that is supported with an actual strawberry odor – in other words, if anything expected appears (see Figure).

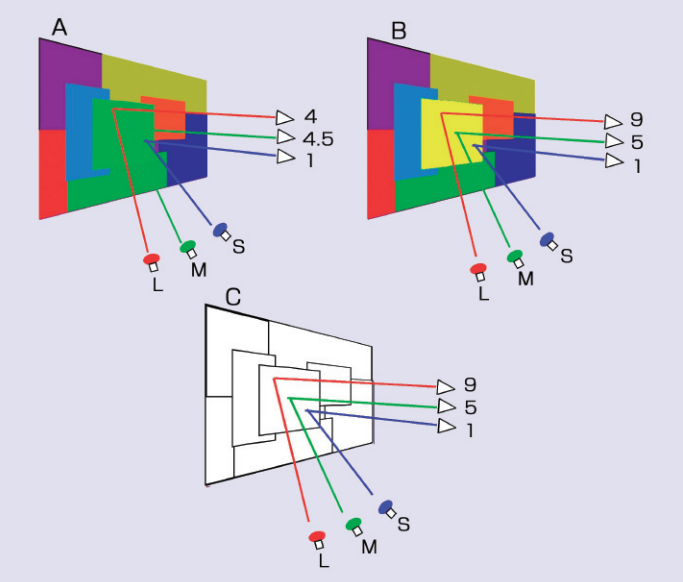

Figure 1: Color consistency
Squares of green (A) and yellow (B) embedded in a Mondrian figure (geometrical abstract figure). We illuminate this form of the figure using lights from three sources, each of which is having a different wavelength. The green square reflects the light of short wavelength S, middle wavelength M, and long wavelength L respectively by 1, 4.5, and 4 (units), while the square B appears yellow by respective illumination of 1, 5, and 9 (units). We next adjust to intensify the middle wavelength light by slightly more, and long wavelength light by more than double so that the reflective light from the green square A becomes equal to that from the yellow square. Then would the square A appear as yellow?

Seeing "taste" in the brain

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The research in which food tasting is understood as part of brain function is underway. As a simple experiment, we tend to use sweet and good-tasting sugar solution or bitter and bad-tasting quinine solution. In the primary gustatory area (the area from the frontal operculum to insula), which recognizes taste, every different part is activated depending on the quality of the taste given. The amygdala and the anterior orbitofrontal cortex become strongly activated when a person tastes something delicious, the posterior orbitofrontal cortex and the anterior cingulate gyrus get strongly activated when a person tastes something bad-tasting.

Odor also plays an important role in taste. The combination of odors and tastes for every food image is determined based on each person's eating experience. In the experiment we have, we first have the examinee smell a food odor such as that of a banana. Next, we show an image of a banana or strawberry, for example. Subsequently, we take a measurement using MEG. Activities at the occipital lobe and the temporal lobe become intensified if the banana image is combined with an actual banana odor, or if the strawberry image

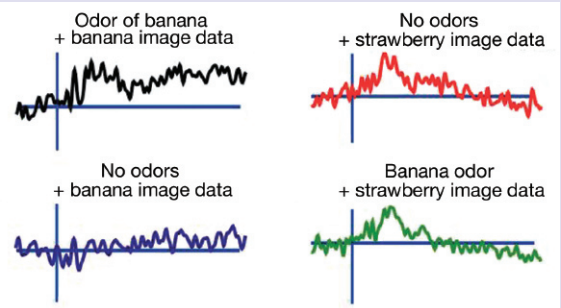

Figure: MEG responding waveform taken from the back of the head.
Cumulative data of 100 times obtained from the same examinee (20-year-old female). The analysis time period is 200 ms before and 1000 ms after the image was presented, as shown by the longitudinal lines.

Consequently, when you smell a good odor first, see the food next, and put it in your mouth to taste to feel good, the various parts of your brain become activated. Once the cerebral mechanism becomes better clarified in terms of identification of taste quality, and emotion of good tasting or bad tasting, the true objective evaluation on tasting would be put into effect so that it would be expected to help apply it for development of much better tasting food.