

When we first discussed brain areas, we talk about two paths of visual processing. The dorsal path determines where objects are, and the ventral path determines what objects are. We also said there are various disorders associated with brain damage that impair the identification of certain objects. Here we will discuss a prominent theory that describes how objects are identified.

According to Anne Triesman's feature integration theory, the first thing that we need to appreciate is that early during visual processing the brain is simply detecting the presence of lines, curves, and their orientations. For instance, a book lying on your desk when viewed from directly overhead would consist of four lines. There are two sets of lines with the members of each set being parallel to each other and perpendicular to the other sets of lines. These lines can be referred to as features.

When first processed, they are processed individually. And what the visual system needs to do is put these features back together in order for the object to be identified. According to feature integration theory, the first processing stage that decomposes objects into features is referred to as the preattentive stage of processing. The second stage puts the features together, is referred to as the focus detection stage.

Analyzing the objects in terms of their features is thought to take place automatically. And therefore, it does not require the subject to attend to the object that is being decomposed. On the other hand, putting the features back together again, or integrating the features, is thought to require the subject to attend to that particular object. These assumptions were tested with a clever experiment. Here's how it went.

On a given trial, a display consisting of several different colored shapes and numbers, like the one on the right, was flashed for 200 milliseconds. Next, a mask was presented. The mask is simply a visual pattern designed to disrupt visual processing. The subject's memory for the display was then tested in two ways.

First, subjects needed to report the numbers that were flashed. The combination of the mask and the number report was designed to disrupt focused attention stage of processing, but not the preattentive stage. The fact that subjects could easily report the numbers confirmed the assumption that the preattentive stage was not disrupted.

Next, subjects were asked to report the shapes in the display and their colors. To do this, the shape and color features of the objects would have to be put back together, which according to the feature integration theory requires attention. However, the mask in the number report phase of the experiment were designed to disrupt the focused attention stage of processing.

Hence, we would expect that the subjects may report the correct shapes and the correct colors due to the

preattentive stage, but get the colors and the shapes mixed up due to the disruption of the focused attention stage. For instance, subjects may report seeing a blue circle or a green triangle. This is indeed what occurred.

The recognition by components theory was designed to explain how people identify objects. This is indeed a very difficult problem to solve since objects can be viewed from an infinite number of points of view when they are occluded by another object or when they are experienced in a never before seen color. What Biederman proposed was that the mental representation of objects was in the terms of geons.

Geons can be thought of as primitive shapes from which all more complex objects can be formed. Thus, an object is represented as a set of geons and the relationships between them. For instance, the coffee cup and the pail on the right are represented by the same two geons, but the relationship between the geons is different. For the cup, the curve is on the side of the cylinder, and for the pail, the curve is on top of the cylinder.

The key assumption of RBC theory is that geons can be recognized from any point of view. That is, they view-invariant properties. This allows us to recognize a book from any point of view. True or false, object recognition involves a dorsal visual pathway. The answer is false. Object recognition involves the ventral visual pathway.

The earliest stage of visual processing involves detecting the lines and curves that comprise an object. The answer is true. Subsequent stages of visual processing put the lines and curves back together again. Feature integration theory assumes that the focused attention stage of processing puts the lines and curves of an object back together again. The answer is true.

True or false? Processing stimulus in terms of its features requires focused attention according to feature integration theory. The answer is false. The focus attention phase of visual processing is when features are combined into higher level representations. According to the recognition by components theory, objects are represented by geons their spatial relationships. The answer is true.