# ARE SENSE-DATA MATERIAL THINGS ?

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If the sense-datum theorist is correct in his assumptions about visual sense-data, there is an intermediary element in our perceptions which is between us and the material object which we perceive. Yet this intermediary element, the sense-datum, has been difficult to describe in concrete terms. Because of the nebulous nature of the sense-datum itself the theory of sense-data has been confounded. The sense-datum need not be considered an objectionable concept because of heretofore imprecise definitions. It is the purpose of this paper to show that the sense-datum is a material entity and an acceptable concept.

For the sake of convenience I will allow that there are such things as material objects which have mass and extension and various other properties of their own which are sensible, these varying with the individual objects. The problem which arises is how we know these objects, in the sense of being acquainted with them.

Since we know an object by having a thought about it, whether conscious or not, and since thoughts are dependent on the brain for their existence, the problem is now to get the material object *into* the brain of its observer. It is clearly not the case that the object can be inserted into the skull, for even if it could, how would this generate acquaintance with the object ? Acquaintance would still depend on the brain's assimilation of the object in a form that it could understand and out of which it could build a thought. The method commonly accepted for this assimilation is perception. However, this is a complex term.

Perception is not merely the reception, by the brain, of a "picture" of a material object. Rather it is at least a three-fold process. The first of these processes is the actual reception of the picture. The second is the discrimination of the elements of the picture from each other. Without discrimination a visual impression of a sense field would be little more than an in-

terestingly colored pattern. The third process is one of interpretation, which is itself a many-fold process and, by which we assign meaning to what we perceive. The assignment of meaning need not be verbal, for if one recognizes a table to be just that, then he does not need to say "that is a table," the interpretation is, then, a mental process (which shall be defined later).

In the first of these three processes, that of reception of a visual picture, much of the problem about sense-data arises. Illumination is the first requisite for reception. But what do light's properties have to do with sense-data ? Whether light can be said to be white or colored, or having extension or not, will have a bearing on the sense-data problem.

Light is electro-magnetic radiation and hence has wave properties. The wave length of the visual spectrum is from about 400 to 800 millimicrons, or $10^{-6}$ meter. What we call violet light is in the neighborhood of 400 millimicrons, green is 500, yellow-orange is 600, and red is 700 millimicrons. May one legitimately ask what is the color of ultra-violet light ? Its wave length is $10^{-5}$ meter; that particular wave length is not visible. We must say that it appears to have no color at all. What about X-rays, what color are they ? Their wave length is $10^{-10}$ meter and they appear also to have no color. Yet are not ultra-violet and X-rays electromagnetic radiation just as is light ? Since they are made from the same stuff as the visual spectrum, how is it that we cannot see them too, and also how is it that they appear to have no color ? Indeed this suggests that the color is not a property of the electro-magnetic radiation at all, rather it is an interpretation by the mind. This theory is supported by reflection on the idea of color itself. If an observer received a red and green image alike, how could his brain differentiate between the wave lengths that he was seeing without resort to some device; color.

Another supporting argument for this idea is that all objects are made out of the same building blocks, protons, neutrons, and electrons. An ounce of gold, however, appears to be a different color than an ounce of silver. Yet they are both made from the same component parts. It goes without saying that the component parts cannot be of two different colors at the same

time. They cannot be gold in color in just that instance when they total 276 components and silver in just that instance when they total 155 components just as a bushel of apples cannot be different ni color than a peck. This leads one to postulate that the difference in color is not in the components themselves, but is somehow connected with their number. It seems that when there are 276 components, the light of about 600 millimicrons is reflected in the largest quantity and this accounts for the goldish color that we perceive.

Often the question arises, in connection with *esse est percipi*, about the color of an unobserved object, say a rose. Does a red rose still exist when it is unperceived ? The nature of color itself would suggest that if anything exists at all it would not be a *red* object. This is not to exclude the possibility that the rose is reflecting light of around 700 millimicrons which we normally call red light. But if there is no observer then there is no one in whom the device of color perception may exist. So we must conclude that the redness does not exist, for the electro-magnetic radiation which is reflected by the rose is not perceived.

Having earlier assumed the existence of material objects, and now assuming that light is electro-magnetic radiation, it is a simple step to see how the image of a material object is projected onto the eye's retina by the lens. From the nature of the lens it would follow that the retina receives an accurate copy of the side of the material object which faces the eye. This has also been verified by photographs of the retina. Assuming that the object is flat, the image is in two dimensions and in clear focus, when looked at straight on. In the case of a non-flat object, the image in focus is of any given point on the object's surface, and slightly out of focus at all others, yet it is still two dimensional and lacks depth. All of this follows from the physiology of the eye.

The mechanisms in the retina, referred to as cones and rods, convert the light which falls onto them into electro-chemical impulses which travel to the brain. The rods and cones are arranged in a sheet covering the interior of the eye. They are close together, but not each rod and cone can receive all of he colors of the spectrum. Hence there may be a considerable distance

between the cones for the reception of red light and so forth. This spatial arrangement is the reason for some of the sense-data phenomena that have caused controversy.

If I see a girl in a red and white pin striped dress at a distance of fifty yards, what color does the dress appear to me ? It appears pink, of course. An opponent of sense-data has argued that there must be a dilemma involved because of the law of excluded middle (1). The primary reason for this dilemma is to be found in the structure of the rod and cone sheet on the retina. Because the image projected onto the retina is small, the distance between the white and red stripes on the image is slight. The cone density on the retina does not provide adequate resolution to differentiate between the red and white stripes. Thus what the brain receives from the retinal sheet is a pink image. The result is what a sense-datum theorist would call a pink sense datum. Thus there is a difference between the "actual" and the perceived color of a material object. Such a difference also occurs in the case of brightness. The light, when shining on the retina of an observer's eye, which is ten times as intense as a reference light appears to be only about two times as intense.

The messages which are sent to the brain are, therefore, not exact duplicates of the material objects of which they are representative. There is a difference between these two and it is this difference which magnifies the importance of some of the sense-data controversies.

When a message from the retina, as imperfect as it is, arrives in the occipital region of the brain there is a pattern imprinted on a sheet of brain cells which is parallel and correspondent to the pattern on the retina. This pattern is a duplicate of the retina's pattern in two ways. First the image on the brain is the same shape as the one on the retina and second it is composed of activated nerve cells, just as was the retina's image. It is this pattern that may form the basis of what we can call a materialistic view of sense-data. There is evidence for the

(1) For an explanation of this view see H. F. BARNES, "The Myth of Sense-data," sec. II, *Proceedings of the Aristotelian Society*, XLV, 1944-45.

proposition that a one to one spatial correspondence exists between retina cells and brain cells such that the shape of the image is preserved. This evidence is taken from medical reports of war victims who received head wounds in the occipital region. These reports consistently show that there is a reduction in the quantity and not the quality of the perceived image. In other words, the loss of sight corresponded spatially to a loss in tissue and not to any loss in visual acuity. For example, if one of these war victims was looking at a checkerboard, he might fail to see the lower left hand corner in such a case when a portion of his brain was destroyed on which that portion of the checkerboard would normally appear.

At the beginning of this discussion it was questioned as to how an object was made known to the brain. It is now clear that material objects must remain obscure and that only imperfect copies may be known. However the reception of images by the brain is only one of the three processes involved in perception. Many other sense-datum problems can be brought to light by investigating the processes of discrimination and interpretation.

Discrimination is a process with which solely the brain is concerned, and not the sense organs. It is the way by which the brain distinguishes one portion of a sense field from another. This is not just as simple as it may appear, for several factors. The first is illustrated by the example of the football game. While watching the game, our attention is focused on the ball carrier, yet we do not merely see him and no other team men. What we do see is the carrier against the margin of the rest of the team. He is the center of our focus and is thus discriminated from his team mates. But the image on the occipital region of the brain contains the whole team. How is it that we pick him out for our observation ? It is clearly not done by the eye for there are many players in the retinal image. The discrimination of the carrier is carried on in the brain itself. It is this discrimination that makes what we see seem intelligible, it differentiates a characteristic of a sense field from the moving expanse of colors and random shapes which is projected onto the retina.

Several factors aid in discrimination: contrast, movement, and repetition.

Contrast also makes it easier for our brain to discriminate any image from its surroundings. Our *attention* is immediately focused on the unusual aspects of the sense field because they do not seem to fit into the general scheme of our field of perception. For example, the word in capital letters a few lines above was most certainly noticed as soon as you neared that part of the page where it was located. But had the whole paper been written in capitals, it would surely have gone unnoticed and undiscriminated from its environmental surroundings.

Movement is another aspect of a sense field which attracts the brain's discriminatory attention. Soldiers on night patrol soon learn to freeze in their paths when a flare explodes. To fall to the ground or duck behind a rock is movement that makes their detection more likely that remaining motionless in plain view (2).

Combined with these aspects of discrimination is repetition. And it is repetition that has the most to do with sense-data. This is because of the tendency to make associations, whether conscious or not, between previous images and present ones. While driving along the road, you may or may not notice a hitchhiker standing near the side. But if you saw the same hitchhiker each day for several months you would surely notice on any particular occasion if he was absent that day. It is this process of discrimination that ties in with interpretation, the final aspect of perception. The transition between the first two processes, reception and discrimination, and the last, interpretation, holds the key to the understanding of sense-data in a materialistic frame of reference.

A sense-datum may appear to have the property M to S when in reality it has the properties M and N. The sense-data theorist would argue that although a sense-datum cannot appear to have properties which it does not have, it may have some characteristics which we do not notice in it. So if the image

(2) The above two examples are taken from C. T. MORGAN, *Introduction to Psychology*, 1961.

on the brain has properties M and N, then we may legitimately say that it has property M but not that it has an arbitrarily named property L. Just because we do not notice property N there is no grounds for saying that N is not a part of the sense-datum. Still one may ask how N could be a part of the sense-data if we did not receive it into our consciousness. For are not data that which we have at our disposal ? The problem is based on the nature of the sense-datum itself.

What many theorists have called a sense-datum is more easily understood as what has been described in the preceding pages: the combination of *reception and discrimination* of the image on the brain. This idea of sense-data is a materialistic one in one but only one respect. That is that the image with which the brain has to work is material in that it is composed of electro-chemically activated nerve cells which form a pattern in the brain. But these activated nerve cells are *not* in themselves the sense-data. For when a man is unconscious and his eyes are open and an image is falling on his retina, we would still like to say that, in virtue of the construction of his eye and his brain, there is an image composed of activated cells in his occipital region. Yet we would deny that he is receiving a sense-datum. He has no "mental picture" before his mind so consequently he has no sense-datum. This is because he lacks the element of discrimination. *Awareness of the image, which is entailed by discrimination, combined with the image itself is what we can call sense-datum.* Without awareness there is no sensed image and hence no sense-datum.

When one sees a stick in water the stick appears to be bent. The sense-datum theorist would say that he is seeing a bent sense-datum because, since the stick is not really bent, something else appears bent and this something must exist somewhere. What he is describnig is the retinal image which has been interpreted by the brain. His description is of a sense-datum. Suppose that an observer is looking at a penny obliquely. He describes the penny as being round. Upon questioning him "Does the penny really look round" he may be forced to say that on second thought it actually looks elliptical. Next expose the observer to a group of drinking tumblers which have round,

in some cases, and elliptical openings, in other cases, and are arranged in no apparent order. Looking at the tumblers obliquely and knowing that some are elliptical he may have difficulty in distinguishing the round ones from the elliptical ones. He might say that from "this angle" the tumblers appear elliptical all alike. There is more to these cases than just describing the sense-data that are available to the observer, because in the case of the penny he could identify roundness when in the case of the round tumblers he could not. Why is this ? Perhaps the remark that although a sense-datum cannot have more properties than it appears to have, it may have properties which we do not notice in it, has some bearing on these examples. Clearly, not noticing some properties suggests that the observer approached the object without having an "open mind" to give adequate attention to all that it contained. In other words he was either looking for one something or not looking for something else in the sense-datum. Because interpretation as well as reception compose the sense-datum, it was his misinterpretation that caused the difference between his sense-datum and his retinal image.

To change the examples slightly, suppose there is a series of letters, M, N, O, P, Q, and a series of numbers, -1, 0, 1, 2, and an observer was asked to read each series separately. After reading the letters we show him the "O" and ask him what he sees. He replies "The letter 'O' ". What would have been his response if we had shown him the list of numbers first ? "The number zero" is most likely what he would answer. Therefore we can say that he was interpreting the information given to him in light of what he expected to follow, namely the letter or number respectively.

In the office there are several windows. What shape do they appear to have ? Of course they appear rectangular. But after further consideration we must admit that an observer is almost never looking at the windows straight on. Rather he looks at them obliquely. They actually appear as trapezoids, although they probably never appeared to be this way to the observer; he never thought of them that way. Why did he not think of them as trapezoids ? For the same reason that he didn't think of the penny as being elliptical. He interpreted his retinal image to

conform to his experience. (Such experience is gained by noticing consistencies between visual, and tactual, etc. sense-data.) Thus his sense-datum was of rectangular windows.

One acquires experience about the size differences of distant and close objects by walking toward a distant object and noticing the correlation between physical distance and apparent size. Evidence in confirmation of this idea is the attempts of children to reach the moon or a distant telephone wire above their heads at a considerable distance. They have not acquired the necessary experience about how to interpret their sense-data. Newly born infants often reach for people and objects on the other side of the room for the same reason. Thus such problems as posed by Austin about distant stars ([3]) appearing as a tiny speck are pseudo-problems because they do not correlate the aspect of experience with sense-data. Suppose one were to ask an African native how far away the sun was. He might indicate that it was perhaps as far as a distant village which we know to be fifty miles off. Yet he can have no accurate idea of its real distance because he has never walked toward the sun or in any way approached it, in order to view its apparent change in size as the distance decreased. He has had no opportunity to experience how far away it really is.

What about such cases as "That white dot on the hill is my house." This sentence is a short for "That white dot on the hill is what my house appears to be from this distance." Actually I do not live in such a small house (dot). When I climb the hill the dot seems to enlarge until it is the size of a normal house. It takes on detail, a porch, stairs etc., and it is in *that* normal sized house which I live. Thus I interpret my retinal image such that I call it a house, because of previous experiences about houses on hills or perhaps even about this particular house and hill which I now perceive to be a white dot.

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([3]) J. L. AUSTIN, *Sense and Sensibilia*, G. J. Warnock edition, 1961.