VISUAL PERCEPTION OF UFOs

Part II

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OVER a period of years psychologists have managed to gain some idea of the perceptual mechanisms by which the brain can interpret the retinal signals. These ideas are in the form of "black box" theories; that is, the logic involved in various operations has been investigated, but the details of the operations in terms of nerve cells and connections are not known. Basically, the brain digests the incoming information and then builds a perception from its own experience. This perception is "tested" against the incoming data to see if it fits. If it fits, all is well; if not, a new perception is tried.

Everyone must have experienced suddenly seeing something in a different way, or temporarily seeing an object in some pattern which is not really there. This is evidence of the brain trying out its perceptions. Experiments have been carried out on the way the data is used, the kinds of data picked out as visual cues, the relative importance of these cues, and the way the brain works under anomalous conditions. Also, the effects of previous experience, learning and subconscious attitudes have been investigated. These are important since we now know that incoming data is modified by experience and may even be neglected if it is too unusual. The problems of perception presented to the brain are interrelated and are difficult to consider separately. However, here we will break up the subject into the perception of distance and depth, of size, of colour, and of movement.

For all these topics the first problem is the limited information handling capacity of the brain. The brain tends to arrange visual data into labelled chunks, reducing the amount of information in the display. If one looks at a regular display of dots, one sees somewhat labile groupings of the dots into columns and squares. This shows the active organising power of the brain; it is always looking for ways of grouping information. Also, perception is not instantaneous, but normally requires time for eye movements and multiple fixations upon various objects, each fixation providing a batch of information to be analysed and incorporated into the overall perception. When you look hard at one small area, such as a TV set, everything else begins to fade and blur until you cannot see it any longer. A constant flow of information is needed to maintain a sharp picture.

The specific cues used in distance and depth perception are as follows:—

1. **Accommodation/convergence cues.** These are really physiological cues and relate to the focusing of the eye and the amount of convergence or "cross-eyedness" being used to see the object. These cues are only useful over a few inches.
2. **Binocular disparity.** Because of the separation between the eyes, the retinas receive different images, with small differences in the positions of objects in the field. One can verify this by shutting first one eye then the other and observing the difference. These images are fused by the brain and the difference used to give depth. Because of the short baseline between the eyes this effect is of little importance at distances over, say, 50 feet. However, over such short distances it is quite good. Unfortunately, with a self-luminous object against a homogeneous background, the mechanism does not work very well and can occasionally be deceiving. For example a small nearby UFO could be mistaken for a larger one further away.
3. **Motion parallax.** If one moves around, the relative positions of objects change according to their distance.
4. **Interposition.** This is when an object covers or blocks off part of another object. This cue is an extremely powerful one and in experimental conditions can override an opposing stereoscopic cue.
5. **Linear and detail perspective.** Linear perspective is due to the geometry of the situation, e.g., railway lines appear to converge towards the horizon. Detail perspective is partly due to the finite resolving power of the eye—that is, less detail can be seen on distant objects.
6. **Aerial perspective.** Distant objects look bluer and mistier. Paintings by Leonardo da Vinci used this device particularly effectively. This effect is very much conditioned by environment: in the clear air of deserts and mountain ranges town-bred people can make large errors in distance judgements. Try standing on top of Snowdon and estimating the distances to the nearest peaks: then find their actual distances from a map! However, this is the only mechanism applicable over any distance in a blank visual field.
7. **Light and shade effects.** These are more concerned with the depth of individual objects and their shape, rather than their actual distance. Normally, light comes from above, and shadows give information about which parts of the objects stick out and which in, i.e., the 3D shape. In summary, to put it bluntly; there is no reliable way of estimating the distance of an unknown object (especially a featureless one) more than a few hundred feet away in a blank visual field.

The cues used for size are the distance of the object (estimated as above) and subjective ideas of its real size. The retinal image (which is what corresponds to the actual angular size) is modified and displayed as a perception of the object apparently much closer. For example, look at one hand at arm's length and the other at half this distance: they look very nearly the same size, providing the images do not overlap. As soon as the hands are lined up, the difference in size becomes marked, and the perceived images approximate to the relative sizes of the retinal images, in this

case in the ratio 2:1. This phenomenon is called Size Constancy; in effect the brain can zoom in like a telephoto lens, preventing objects shrinking with distance as much as they ought.

This effect will also alter our subjective impressions of perspective. Since we expand distant objects, perspective will be reduced. This explains why photographs often seem to show far more perspective then we see. The perspective in the photograph is true geometrical perspective and is quite different from our perceived world. Size scaling is not a conscious process, but nevertheless effectively alters what we see. If the subjective distance estimate is wrong the size will also be wrong. Objects against the sky present few distance cues, so the brain guesses the distance and applies the appropriate size scaling. Experimental data indicates that the actual retinal image size is effectively inaccessible to the conscious brain. Therefore, it may be possible to get a truer estimate of the angular size of a UFO by asking "How big do you think it was?" and "How far away do you think it was?", then dividing one by the other, than from the traditional comparison with another object. We therefore recommend that investigators try both approaches and endeavour to judge for each particular witness what faith may be put in each estimate.

An example of inappropriate size scaling is the Moon Illusion. When the moon rises over the horizon the brain has plenty of cues to show that it is miles away. Hence it steps up the size. When the moon is overhead, we have no cues and no idea how far away it is. The brain guesses a distance, usually around 200 yards (estimates of this vary). The scaling for this distance is far less than that for the horizon moon and so the moon looks smaller. A consequence of this is that the moon makes a very good comparison yardstick for estimation of angular size since any other object will be subject to the same illusion.

Effects like these described here will apply to UFOs and so angular size estimates can be strikingly inaccurate. Many witnesses assume a nice convenient size for an object, to suit their ideas about what it is and subconsciously make everything else fit. For example, the 30 odd feet often reported for a disc-shaped UFO should be treated with caution. It is too much of a nice round number, about the size of a spacious living room.

Another effect altering angular size is Shape Constancy. Normally, one has a good idea of the actual shape of an object, and if it is viewed obliquely, one corrects for this and sees it as if viewed from more nearly straight on. For example an obliquely viewed circle presents an elliptical retinal image, but quantitative studies have shown that the perceived image is considerably less elliptical than the retinal image. This applies to UFOs, especially as many witnesses think of them as circular. If they saw an ellipse they would correct it and actually see a more circular object. To summarise: the brain adjusts size according to the assumed distance. If insufficient or contradictory distance data is fed to the brain, it will make an arbitrary "bet", based on as yet little known factors, and alter the size accordingly. Often any slight inconsistencies which are present are altered or removed from the perception—one actually does not see them. The brain will hold on to this arbitrary hypothesis unless more data comes in.

An example of a sudden change is when an aerial object goes behind something and one suddenly sees the distance properly. This can be quite startling and shows the extent of the effects. Colour and brightness perception have already been mentioned, but it is worth repeating that the overall background illumination will have an effect, especially on brightness or whiteness estimates. In fact, the brain can be deceived by a black object selectively strongly illuminated against a dim background. The object will actually look white!

Movement perception is of special interest, since a lot of UFO data is based on the way UFOs move. There are two basic movement cues: movement of the retinal image and movement of the eyes when tracking an object. There are also inferential cues, such as movement parallax, used to show when the observer is moving, and interposition, i.e., objects passing behind things. These last two are less basic and require more experience and perceptual learning. The actions of the first two are linked together; during eye movements the retinal image signals are cancelled against the eye muscle command signals. This is why the world does not swing round during voluntary eye movements, but will if the eye is pushed *gently* by hand. This balance is quite a fine one and can, if upset, give rise to an illusion known as the Autokinetic Effect, which occurs when a small light is fixated against a homogeneous, usually black, visual field. (The effect will also work with a black dot against a uniform white background.) After looking at the light for a while, it starts to move in various ways, from side to side, up and down or in swoops. This effect is probably due to changes in the command signals from the brain keeping the eye fixated properly, as the eye muscles fatigue and alter a little.

The effects of fatigue can be seen by looking hard to one side for a short whole and then looking back at the light. The illusion is then enhanced and the light moves around, normally in one plane, e.g. horizontally after fatiguing the horizontal control muscles. This illusion has been invoked in the past to explain away UFOs as planets or other fixed lights. Mostly the movements are rather small, but with eye fatigue may be quite large. However, they are centred around the fixed position and a fairly homogeneous field is required. Under normal conditions we think it unlikely that this illusion would give many UFO reports, except that excitement or old age may exaggerate the illusion.

The retinal image movement cue seems to be analysed by two mechanisms. One in effect functions discontinuously, calculating velocity by dividing distance travelled by time taken; the other seems to measure velocity directly rather like a speedometer, which has no explicit clock. Like a speedometer this latter mechanism has to be calibrated. It is rather labile, and appears to be calibrated at intervals against the other mechanism. It can also be fatigued, or will adjust itself to continued movement in part of the retinal field. For example, if a rotating spiral is fixated for a minute or so, when the rotation is stopped the

spiral seems to expand, but paradoxically it also seems to stay still. This paradoxical effect is possibly due to the other velocity channel which is not affected. Because of this clearly perceived paradoxical effect, this sort of illusory motion is unlikely to be involved in spurious UFO sightings. Some clues to the retinal physiology of this labile velocity mechanism do exist.

Experiments have shown that certain retinal circuits respond only to movements at a certain rate, and possibly these circuits contribute to this mechanism. Assuming that the movement cues are correctly received, the brain still has to decide what is moving. Since all motion is relative, there is always a choice as to which object is the moving one, or indeed whether it is the observer himself that is moving. For movement of part of the retinal image, the brain usually bets that the smaller objects are moving. Indeed, if a spot is shown on a large screen and the screen is moved, the observer will see the spot moving! This is important since the brain has clear evidence that it is the screen moving, but discards this evidence in favour of a more likely hypothesis, judged on previous experience.

This effect is also seen when clouds scud past the moon, but it is clearly a paradoxical effect in that the moon is also seen to be stationary. Another form of illusory movement is generated when the observer is looking at an object like the moon whilst himself moving. The moon is assigned a distance of a few hundred yards, and since it neither gets left behind nor changes its angle relative to the observer, the brain assumes it must be moving also. This effect is also odd in that the rate of movement is less than the observer's and is seen to be so, although the moon is not left behind! Special problems arise when the observer is himself moving. If the whole retinal image is moving, this is generally interpreted as motion of the observer, rather than as motion of the whole world. Also, when in motion, an observer cannot so easily judge relative motions in parts of his retinal field. Car drivers will know how difficult it can be to decide whether an opposing car is parked or moving. More information than normal is required, and information from other senses such as the balance organs is taken into account, before the brain makes a decision. Consequently, any movement estimates made from a moving vehicle should be treated with caution. To sum up perception to motion in UFOs: the basic mechanisms work remarkably well against even blank backgrounds, and illusory effects are probably quite small. Obviously, this all applies to motion transverse to the observer; motion towards or away from the observer is analysed by the depth-perceiving mechanisms mentioned already.

Overall then, the brain uses various cues to suggest various perceptions which are constantly tested against the incoming data. Normally this is satisfactory, but in situations where there is little information or unusual and conflicting data, the brain will make a good "bet" and may be wrong. With limited data the error will not be shown up and very unusual data may be discarded. The perception of the detail on a UFO is a case here. If the data coming in was completely new, it is probable the brain would pick a likely simplifying hypothesis based on the observer's experience and attitudes. The observer will then see and remember this interpretation of the data, and one cannot tell what the original was really like.

Indeed, it is arguable that no-one could properly see a completely new visual stimulus, with no relation to anything seen before. Obviously we cannot imagine such a stimulus (but consider for example the plight of a primitive savage brought up in a round mud-hut, where nothing in his culture is square and little enough straight, being faced with an exercise in geometry) and it must be borne in mind when dealing with sighting reports that the unusual facets of the object are just the ones most prone to severe misinterpretation. Also, it should be pointed out that after all this perceptual interpretation has occurred, there must be the storage and retrieval of the perception. This article has specifically ignored the whole subject of memory, and what is written here is strictly applicable only to the immediate perception. Over the hours, weeks or years before an investigator gets to the witness many distortions will creep in—a fit subject for another whole article. Suffice it to say that an account may well be as much fossilised by much telling and thinking about after a few days as after five years.

CORRECTION

Owing to a printing error the parts shown in square brackets were omitted from *The Problem of the Frankensteins* in the May/June issue.

Page 17

. . . first and second Adams. The first type of extraterrestrials would possess the characteristics of those who belonged to the first Adamic race ('So God created man in his own image . . . ' Genesis 1 v. 27); these are the descendants bearing characteristics of [the original Adam, Galactic Man, who may be coming from any part of our galaxy. The second type would possess the characteristics of] those who belonged to the second Adamic race ('And the *Lord* God formed man of the dust of the ground . . . ' Genesis 2 v. 7); these are the descendants bearing characteristics of the second Adam, earth animal or chemical man, who may be coming perhaps from a limited space, from within the confines of our own solar system. So present humanity, including the extraterrestrials . . .

Page 18

. . . Adonai[8]. As it has taken all this time to evolve a physical body of 'nature's chosen form' for the human race, our [extraterrestrial cousins—with all their advanced] technology—could hardly expect to manufacture one which would exactly match or equal its prototype in such a comparatively short period of time.

Now the cases of Mr. and Mrs. Barney Hill . . .