

**E. H. Gombrich, *The Evidence of Images: I The Variability of Vision* C.S. Singleton (ed), *Interpretation: Theory and Practice*, 1969, pp.35-68
[Trapp no.1969C.1]**

LATE IN 1967 a book was published in England which is as charming as it must be fascinating to all who are interested in the theory and practice of interpretation.[1] Its principal author is the Dutch naturalist and ethologist Niko Tinbergen, who combined with a friend and artist to photograph the tracks left in the sand of the dunes by a variety of creatures and to reconstruct the stories they reveal in word and in image. The illustration I selected (Figure 1)



shows the tracks of an oyster catcher peacefully walking along over the dunes till something apparently alarmed it, the walk turned into a hop, leaving deeper imprints in the sand, and it took off on its wings. This is not all the naturalists could infer from the configuration of the sand. They know that a bird cannot take off except precisely against the wind. At the time of the event, therefore, the wind must have blown from the left of the picture. But if you observe the ripples of the sand, they were formed by a wind coming from the direction of the camera. Accordingly, the tracks correctly interpreted reveal another story of the past: there was a change of wind between the formation of the ripples and that of the footprints. Not all of the picture illustrated is a photograph. What the artist has done is to superimpose on it his reconstruction of the oyster catcher taking off. This is how it appears to his mind's eye and how, he is sure, it would have looked to the camera if one had been present at the moment.

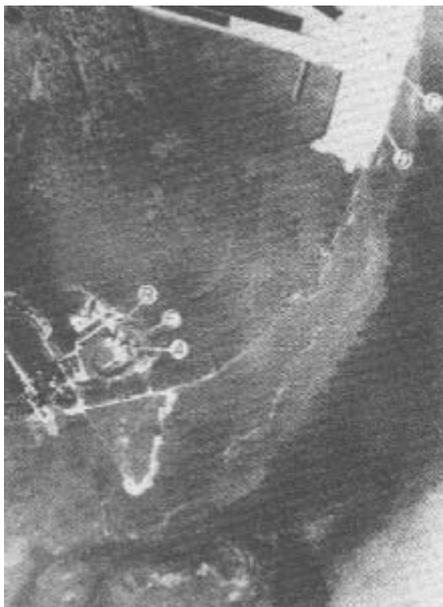
I wanted to present at least one of these charming little detective stories because they seemed to me to elucidate much of the theory of interpretation. To interpret a footprint means to match it in our mind with one of the creatures whose shapes and habits we know. The greater the repertoire of our knowledge and experience, the more likely we are to find the perfect fit. Sometimes, as we all know from detective stories, the fit may be literally perfect—a unique foot- or fingerprint may prove the presence of an individual at a certain spot. Sometimes, on the other hand, the fit will be more conjectural if, for instance, the tracks are less distinct or would fit several species. Occasionally, perhaps, the interpreter may be confronted by a track which sets his mind spinning. There is a story by Karel Capek of the single footprint on a wide virgin plain which is as mysterious as any miracle.[2] Where we cannot reconstruct, where we do not know what is possible, we cannot produce a convincing fit, we cannot interpret.

I do not know whether anyone would call a footprint an image of the foot, but I certainly think it will be helpful if we look at images as traces, natural or artificial ones. After all, a photograph is nothing but such a natural trace, a series of tracks left not in the sand but on the emulsion of the

film by the variously distributed lightwaves which produced chemical changes made visible and permanent through further chemical operations. In fact, what the audience of a lecture sees on the screen may be described as the track of a track of a track, all along a chain of mechanical transformations. The screen shows a track or a shadow of the inverted slide in the projector made in a series of operations from the track in printer's ink of the block made from the photograph, which was of course made from a negative which preserved the tonal gradients but not the absolute tones of the developed film or plate. We do not usually think of these intermediate stages, because we rely on their capacity to transmit the original trace, though we know that changes or distortions are possible at every stage. Photographs can be touched up or tampered with or, as in our case, supplemented by artificial traces made not by light but by an artist's hand. Unlike the natural trace the artist's trace is made with the intention of being interpretable. It is deliberately clear, rather than blurred, to facilitate the process of reconstruction for those of us who know less about oyster catchers than Niko Tinbergen and his friend.

For knowledge, a well-stocked mind, is clearly the key to the practice of interpretation. Having referred in my title to the evidence of images, I wished to indicate the fact, of which I have already produced evidence, that I would not confine myself to my field, the study of art. The use of images as evidence clearly extends much beyond this field, and I believe that even the student of art can profit from a consideration of the wider problem. Readers of my book *Art and Illusion* may remember that I there confess that my interest in these questions was originally aroused by my wartime work at a listening post where problems of perception and interpretation were thrust upon us in a severely practical context.[3]

I never was concerned with the interpretation of pictures, but of course this constituted one of the most important branches of wartime intelligence. The story of the interpretation of tracks left on the film of a reconnaissance aircraft which flew over the German experimental station of Peenemünde, has now been revealed in a thrilling book by David Irving.[4] It illustrates almost to perfection the role which knowledge and reconstruction play in such a process, both in the failures and in the ultimate success. Our illustration (Figure 2)



shows the part of the station where the German long-range rockets and flying-bomb launchers were ultimately located, but it gives no idea of the difficulties with which the British intelligence was

confronted. Rumors had reached them early in 1943 that the Germans were working on such weapons, but there was no indication of what they might look like. In fact, it was here that the act of reconstruction first went grievously wrong. The authorities concerned had no official cognizance of any form of rockets fired by liquid fuels, though it turns out *post festum* that they could have had. Now a rocket fueled with cordite would have to be gigantic to achieve an effective range, and accordingly would have to be transported on special trucks and launched from enormous contraptions. It was for these that the intelligence looked and looked in vain. Moreover, it so happens that the officer in charge of the interpretation of these reconnaissance photographs was in his peacetime capacity a classical scholar of some repute whose main interest was in Roman water engineering. It is amusing in retrospect to read that he interpreted a rocket standing at Peenemünde in the now familiar position as a "thick vertical column of about 30 ft. height." [5] As to the objects "C" and "D" in the right-hand corner, he plausibly associated them with water engineering and described them as lengths of pipe connected with dredging operations, an hypothesis which impeded their interpretation as launching catapults for many months to come. Only after a further reconnaissance the officer wrote with the true caution of a classical scholar that there was a train in the area which "appears to carry a cylindrical object 38 ft. by 8 ft." [6] It turned out later that the same object had also been visible on the earlier photograph, but nobody had noticed it. "That is hardly surprising," as Irving says, since all there was "a blur of white on a smudge of grey one and a half millimeters long." [7]

The story now moves to the tangled world of departmental rivalries. A scientist, Dr. R. V. Jones, who was worried by the slow progress of operations, managed to obtain a private set of these photographs and interpreted the object as a white rocket. He made his interpretation known, and, questioned from above, the classical scholar admitted, still very cautiously, "that the appearance of the object is not incompatible with its being a cylinder tapered at one end and provided with three radial fins at the other." [8] Calling for the earlier photographs, he suddenly saw several such finned objects dotted around the place which he had not seen before. A few weeks later he was even prepared to refer to them as "torpedoes." Fortunately for us, his caution did not win the day. Peenemünde was attacked from the air in a devastating raid, and the German rocket program was set back considerably.

The story of how the true state of affairs was pieced together from stray information and tested against the photographs would take too long to relate. But I cannot withhold the crowning episode. After the raid it had become clear that the Germans had transferred and dispersed much of the production, and the same Dr. Jones was convinced that a site in Poland was now the one to be watched. Once more he obtained photographs and stayed in his office for most of the night till in the early hours of the morning he at last found a blurred white speck of the familiar kind by a railway siding. His reconstruction of the situation was confirmed. But this discovery was too much for the professionals. An official memorandum was sent, pointing out the dangers of amateur interpretation of aerial photographs. What Jones had called a rocket was obviously a locomotive. "Nobody should be allowed to comment on photographs without the proper training." [9] It is a story which should be widely disseminated wherever professionals claim a monopoly of wisdom. For the truth is, of course, that one can learn from the theory of interpretation that interpretation cannot be wholly learned or taught. The reconstruction which fits does not start from the blurred white speck, it ends there. To think of the object that would match it is as much a feat of the creative imagination as of trained observation. There can be no professional stocking of minds with an infinite variety of possibilities. All the professional should learn, and obviously never learns, is the possibility of being mistaken. Without this awareness, without this flexibility, interpretation will

easily get stuck on the wrong track, where it will see locomotives which should be there according to the book of rules.

I hope my initial examples will not be found too farfetched, for I believe they present a slow-motion analysis of a process which is much more universal, indeed basic to our understanding of that elusive phenomenon I have called the "variability of vision." To interpret is to construct, and, as I shall try to argue, such construction always underlies our reactions to incoming stimuli. I am not, of course, a psychologist, and so I should like to quote in support of this point of view the book by Ulric Neisser of Cornell University, *Cognitive Psychology*.

The notion that perception is basically a constructive act rather than a receptive or simply analytic one is quite old. It goes back at least to Brentano's "Act Psychology" and Bergson's "Creative Synthesis," and was eloquently advanced by William James. However it is not put forward here on the basis of its historical credentials ... we shall see *that the mechanisms of visual imagination are continuous with those of visual perception*—a fact which strongly implies that all perceiving is a constructive process.[10]

In *Art and Illusion* I called this constructive process the Beholder's Share, and I argued that, strictly speaking, no two-dimensional image can be interpreted as a spatial arrangement without such a constructive contribution of our spatial imagination. This goes for any snapshot no less than for a reconnaissance photograph from the air. The difference is only that as a rule an ordinary snapshot or picture post card shows us familiar classes of objects, people, houses, and trees which superficially, at least, make the work of matching and reconstruction quite easy for us (Figure 3).



But the very ease with which we assemble these items from the storehouse of our mind also hides from us the limits of our reconstruction.[11] After all, normally nothing depends for us on finding out from such a picture the exact dimensions of the President's House of Johns Hopkins. Nor have we any reason to feel troubled by the fact that we could not tell the direction of the branches of the trees. We see a tree and leave it at that, unless someone should come with a mind of an intelligence officer and ask us to make a three-dimensional model of those branches when, obviously, an infinite number of solutions would be possible and none provable.

In fact, it is easy to show how readily our constructive process can be tricked into a false reading of an image. Most people will tend to read Figure 4[12] as representing a room seen between some pot plants with a table some distance away in the background, and the picture of the table (Figure 5) will be reconstructed as a table of normal size.



Figure 4. A Table behind Plants

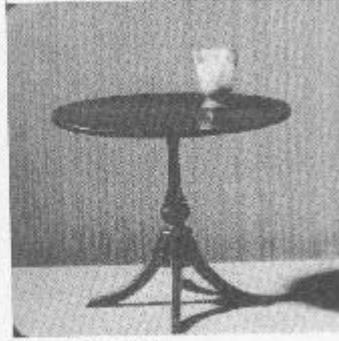


Figure 5. The Table

Once the reading has settled they may even for a moment see the woman as a giantess (Figure 6),



Figure 6. The Scale of the Table

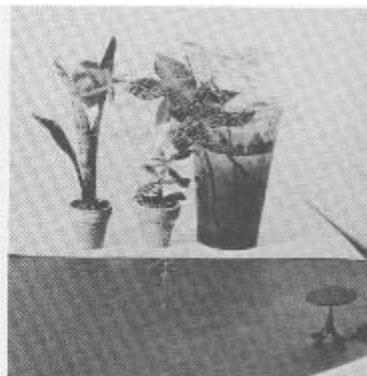


Figure 7. The Plants behind the Table

till they have switched the construction and look at the arrangement from the other side (Figure 7). Now, of course, the original view has to be reconstructed to accommodate the fresh idea of the toy table.

The possibility of such misreadings induced by unfamiliar objects stands in the center of the famous experiments in perception devised by Adelbert Ames, Jr. [13] The most famous of these is a so-called distorted room, a room of unexpected skewy shape which, thanks to the laws of perspective, becomes indistinguishable from a normal square room when seen through a peephole (Figures 8 and 9).



Figure 8. Monocular Distorted Room from the Viewing Point

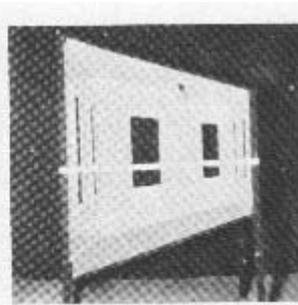


Figure 9. Monocular Distorted Room from Another Angle

Normally, so sure are we of this reading that the people appearing through the windows, which actually lie at different distances, appear unnaturally large or small.

With these demonstrations we have, of course, moved from the problem of interpreting tracks on a photographic plate to a very different problem, the problem of how we perceive the world around us. But is it so different? Could it not be argued that when we see we interpret the tracks left by the lightwaves on the rods and cones of our retina and transmitted from there to the visual cortex? This is indeed the account which was favored by psychology for many centuries. Its classic formulation is to be found in Berkeley's *New Theory of Vision*. According to this theory, the stimulation of the retina results in a flat image which the mind can interpret as a three-dimensional world only through the experience of touch. There is an all-important difference, according to this account, between the visual sensations, the raw data transmitted to the brain, and the picture of the environment built up by perception. This picture, like the cases here discussed, is a result of knowledge, of experience; it must be distinguished from the stimulus configuration, which is all we really see.[14]

But is it true that we ever really see the uninterpreted sense data? Can we ever experience that uninterpreted vision which the nineteenth century described with the loaded term of the "innocent eye"? In *Art and Illusion* I criticized this notion with the aid of philosophical and psychological arguments. In particular I drew on the methodological views of my friend Sir Karl Popper, who has consistently attacked the positivist account of "sense data" as the ultimate basis of our observations.[15]

Since I published my book the opponents of the sense data theory have received strong reinforcement in the shape of a new book by that great student of vision, Professor J. J. Gibson. Its very title, *The Senses Considered as Perceptual Systems*, is a challenge to the traditional distinction between sensation and perception.[16] Not that Professor Gibson is inclined to deny that our nerve ends come into play in this process; what he denies is merely that it is either possible or useful to try and separate this part of the process from its manifold interactions with others. If I may appeal to a simple experiment to illustrate the artificiality of such a separation, I would ask the reader to join his hands together. He will certainly feel that they touch each other, will feel their warmth and their texture, but, if we ask ourselves how this feeling is derived from individual nerve ends in our right hand and our left hand, we soon discover that the question is absurd. The sense data are something we read about in books; they are not to be analyzed out. Why should they be? Our sensory systems developed in the process of evolution to ensure our survival, to enable us to find our way through the world in search of food or mates and to avoid predators. It is the whole of the organism which reacts to stimulation from the environment, and it is this reaction that matters more than our awareness. Least of all were we endowed with eyes in order to peer through a keyhole and be puzzled by such posers as the ingenuity of Ames has contrived. We have two eyes, and, though introspection would never detect this, it is the disparity of their stimulation which contributes to the resulting perception. There are many other sources of information, such as texture, which are utilized by the sense of sight and which traditional accounts have vastly underrated. But what is really decisive is that visual perception is geared to movement. Granted that the static view of a room through a stationary eye allows of many interpretations, Professor Gibson stresses that as soon as we change our position the transformation of the optic array is what he calls univocal: there is one and only one configuration which fits it (Figure 10).[17]

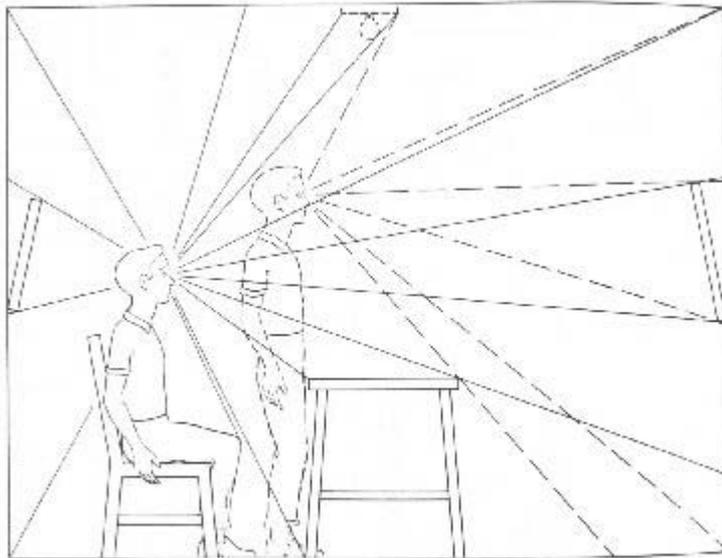


Figure 10. Transformation of the Optic Array

What matters in real life is not that textbook abstraction, the stationary image on one retina, but the succession of stimuli which we experience as we are walking toward a room (Figure 11).

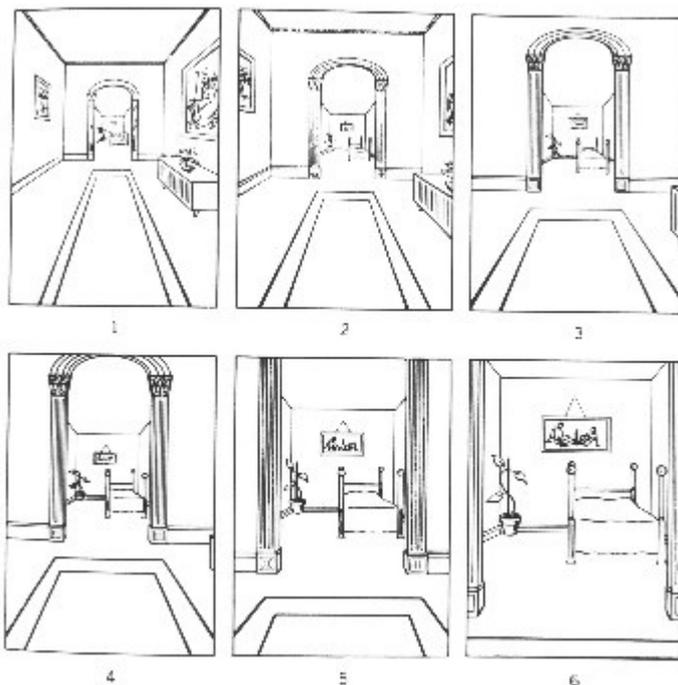


Figure 11. The Optical Transition from One Vista to Another

We do not need to call in touch or previous knowledge to explain that the structure of the environment can be perceived. Even if we want to think of the mind as solving puzzles transmitted to it by nervous impulses, this particular puzzle allows of only one solution, only one piece of the jigsaw fits into the gap.

The case Professor Gibson makes for this view is so strong that he must indeed ask himself how it is that people ever thought otherwise? His answer is that they were deceived by the very analogy I, too, have drawn, the analogy with the interpretation of pictures. If it were not for the existence of

paintings, Professor Gibson says, people might never have speculated about sense data and images on the retina. They would not have wanted to reduce the visual world to what he had earlier called the visual field, that flat array of colors which needs interpretation.

When I wrote *Art and Illusion* Professor Gibson had only uttered this suspicion in an aside in the course of a polemic. I am glad I noticed it for I do believe that he has initiated what may be called a Copernican revolution in the study of visual perception. But I would not claim that in my book I fully digested his message, nor, if I may say so without impertinence, am I sure that I want to swallow it whole. For the radical separation between the interpretation of pictures and the perception of the world has some consequences which do not seem to me entirely to square with the facts.[18]

It was a philosopher, my friend and colleague Professor Richard Wollheim, who insisted on this separation in the full knowledge that it would be rather fatal to the approach I advocated in *Art and Illusion*. [19] For this book rests indeed on the assumption that the illusion which a picture can give us can be explained by the similarity of our reaction to the picture with our reaction to the visible world. Wollheim attacks both sides of that equation. He would admit that we interpret a picture, but he does not think that this interpretation will result in an illusion of reality except in marginal cases where the eye is fooled but the mind left empty. [20] Nor would he admit that it makes sense to speak of interpretation in our commerce with the visible world, for what is it we interpret if we abandon the idea of sense data as he himself is willing to do?

In writing the preface to the second edition of my book I briefly alluded to this disagreement about the term "interpretation" and merely mentioned that I was not wedded to words. Call it something else, I implied, provided it describes what is going on. Now Professor Gibson does indeed call it something else. In his terminology the sensory system picks up and processes the information present in the energy distribution of the environment.

I think and hope I am fully alive to the danger of new words, specially fashionable words, becoming new toys of little cash value. But I do think that this way of putting things may help not only to clarify the point at issue between Professor Wollheim and myself but also to bridge the gulf Professor Gibson has deliberately opened between the world of pictures and the real world.

It certainly was of tremendous importance to stress the amount of information which the organism can utilize in its commerce with the visible world and to contrast it with the relative poverty of information which even a detailed color photograph may contain—though the latest technical wizardry of the holograph reminds us that the ordinary photograph by no means represents the limit of mechanical information storage. [21] But, granted that in walking or driving along a road we would have information of a very different order from what the snapshot gives us, and that we thus could perceive the invariant shape of the road, the houses, and the texture of the road without ambiguity, I am not sure how far our capacity to process this information would ever go. Take the example of trees once more. As we passed them their branches would shift and turn and execute a complex movement which would in theory allow us to reconstruct their shape—but how much of their shape? To how many of the twigs could we attend? And what of the trees farther away? Even as we move, those some distance from us cannot present a univocal picture even for an observer of infinite capacity. The redundancies decrease progressively and increase the need to supplement the information from the store of our imagination. As our eyes scan the distant prospect, uncertainties about the size, shape, color, and meaning of objects surely begin to matter. I should put meaning first, meaning for us. Not that Professor Gibson neglects it. He beautifully describes

how in situations of reduced illumination, at dusk or in mist, for instance, our sensory system goes hunting, as he puts it, to make out what concerns it.[22] Sometimes in such a situation the process runs ahead and we believe we have received information that is not present. We all know that this happens particularly when our emotions are involved through anxiety or desire, which makes us keyed up, as the saying goes, for certain information and allows the slightest partial hint to trigger the relevant reaction. We will attack or run away at the slightest sensory suggestion of danger or the hoped-for prey.

We know that animals can thus react to false or insufficient stimuli, and so can man. But is it not also true that man in such a situation can do what the animal is presumably incapable of doing, turn upon himself and try to learn from the mistake? Would the primitive hunter never have hurled his spear at a shape or rock he had taken for a recumbent bison only to discover on coming closer that he had been deceived? Sometimes, we may surmise, the victim would have blamed a ghost for this mocking apparition, but might he not also have been moved to go back to the place and scrutinize the spot to see how he could have been deceived? And would this self-scrutiny not have forced him to slow down and watch that semi-automatic process that had made him see a bison instead of a few bushes and a stone? Might he not even, to spin out my "Just-So-Story," have asked a mocking companion to come and see for himself how close the resemblance was from that point? Maybe the companion said "I cannot see it," or, maybe, he learned to recognize the resemblance. If he did, he also experienced the variability of vision: the stone began to "look" different.

A trained observer has described this variability so vividly to me that I have asked him for permission to quote his account in this essay. Professor Niko Tinbergen here tells of a perceptual shock he experienced during an expedition to Greenland:

In late autumn, when the land was already covered in snow, but the ocean was still free of polar pack ice, I had climbed a mountain of some 3000 feet. From the top I looked down on the partly frozen fjords, and some ten miles away I saw the ocean.

Looking through my field glasses towards the East—the sun was approximately in the South—I suddenly saw that the surface of the faraway ocean was moving wildly. Having been warned that in that area severe gales may spring up in a matter of ten minutes, I decided to descend quickly. But I had one more good look, and suddenly I realized that what I had thought was violently moving sea, was in fact a cover of pack ice that had arrived from the North.

The ice floes are very thick, and also irregular; they are about four feet above the water, and of course separated by gullies of that depth. Scattered among the pack ice (which is seawater frozen in the polar basin, covered with several years' snow), one sees icebergs of varying size.

Now the interesting thing was that, at the instant I realized it was not waves, but ice, I saw very vividly how the movement stopped. In one flash the violent motion turned into complete rigidity. I still remember the feeling of shock I had, so vivid had been the impression, the *certainty*, that the ocean surface was in wild motion. I have never since experienced such a striking example of knowledge determining interpretation, and what amazed me was the almost physical blow I received when my interpretation made me see something quite different from what I had seen before. The interesting thing was that the color changed too. I had interpreted the bluish shades in an overall glaringly white surface as the only places where I saw the reflection of the blue sky in the water, and the rest as glitter—half against the sun. Now I suddenly saw a brilliantly white snowscape with irregular shadows.[23]

We need not credit our hypothetical primitive hunters with the power of analytical introspection which marks the great scientist to postulate that the discovery of perceptual mistakes can lead to

an increasing awareness of the process of seeing, without the intervention of pictorial devices. Like the intelligence officer of my earlier example, our cave man on the warpath would have begun consciously to match and describe shapes. Only this increased awareness, I would argue, could also lead him ultimately to create artificial tracks and traces, and so to images.

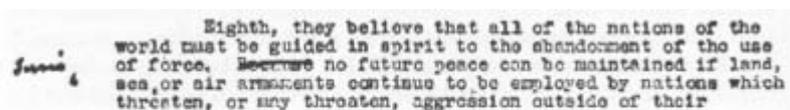
As a student of art I am of course sorry to deprive painting of the central role in man's awareness of himself which Professor Gibson has assigned to it. But I have learned from Sir Karl Popper to assign that central role to man's critical faculties, to his ability to learn from his mistake in a process of trial and error which can be communicated and discussed. This capacity presupposes a certain amount of control over the processing of information, a shift in the threshold of the automatism, but not, if I am right, a total separation between sensation and perception. What I have called in my title "the variability of vision," therefore, is not, in my view, a switch between discontinuous processes, but a shift between what has been called object concentration and stimulus concentration.[24] The fact that stimulus concentration can never come down to the rock-bottom threshold of retinal data seems to me well proved. But I certainly would agree with Professor Gibson that man-made images and symbols provide a most useful testing ground for the exploration of such shifts and the amount of processing that can go on without our becoming aware of it.

The concept of information was developed in the theory of communication and it is here that the point I wish to stress can be most easily demonstrated, particularly if we look at the matter from the angle of the sender rather than that of the recipient of a message. Most of the messages we send out in daily life through gesture, speech, and action depend for their efficacy on the recipient's awareness of the context. They are understood, as the theory of information puts it, because they serve to remove a specific doubt, or, more precisely, because they enable the recipient to choose between alternatives about which he had been in doubt. A nod will suffice to decide between yes and no, a pointing hand will tell the questioner which direction to take at a roadfork. Most message systems employ to some extent what engineers call redundancies, to insure their safe reception. We accompany our gestures with words, and words, if necessary, with written symbols. But the surer the context is given the more we can strip down the redundancies and reduce the actual information to a minimum, relying on the recipient's readiness to supplement it from his own store of knowledge. At least those of us who have a bad handwriting think that we have a perfect right to do so. We cut out the redundancies of the letters and hope the context will make up for them. Up to a point we have a right to believe this. Take the word of Figure 12, which happens to be in the handwriting of Sir Winston Churchill.[25]



Figure 12

Surely there are not enough distinctive features to identify the letters in this wavy line, except that the first letter must be an *s* and the last, to judge by the dot, an *i*. But as soon as we see the context the process becomes almost automatic. The word is a correction made by Churchill on the margin of the draft to the Atlantic Charter suggesting an alternative to the word "because" at the beginning of a sentence (Figure 13).



Eighth, they believe that all of the nations of the world must be guided in spirit to the abandonment of the use of force. *Sami* Because no future peace can be maintained if land, sea, or air armaments continue to be employed by nations which threaten, or may threaten, aggression outside of their

Figure 13. Extract from the Draft of the Atlantic Charter

It therefore can only be *since* and it also now begins to look like *since*. In fact, we are hardly bothered now by the contradictory information of the shifted dot.

I have taken the example from reading because reading shows our capacity of information-processing at its most mysterious. In fact, discussing this enigma, Professor Neisser comes to the paradoxical conclusion that "rapid reading represents an achievement as impossible in theory, as it is commonplace in practice." [26]

But, whether we can fully understand it or not, one thing is clear; the rapidity of the process would not be possible unless it had become almost automatic. We adjust to the message and process the signs obediently even though, in one of Neisser's examples, the A and the H really have identical form (Figure 14). [27]



Figure 14

I am even more puzzled by the way in which we switch our response together with the language of such messages as *pain et convert* or *pain and sorrow*. To me, at least, it takes an effort to slow down sufficiently to realize that English *pain* and French *pain* are composed of the same signs, for my verbal and auditory reactions are too automatic.

The point I wish to make is that in reading we are not aware of the individual letters, nor even of the individual words, but only of the information itself, once it has been processed. You may have read a whole book and yet be unable, on closing it, to specify what font it was printed in. Those of us who have become more or less bilingual by force of circumstance are often unable to tell in which of the two languages we have just spoken or been addressed. [28] Understanding is so automatic that the symbol has become transparent and disappears from awareness; but of course it must first be identified as such a symbol. Where our script is disguised and assimilated to the forms of Indian scripts (Figure 15)

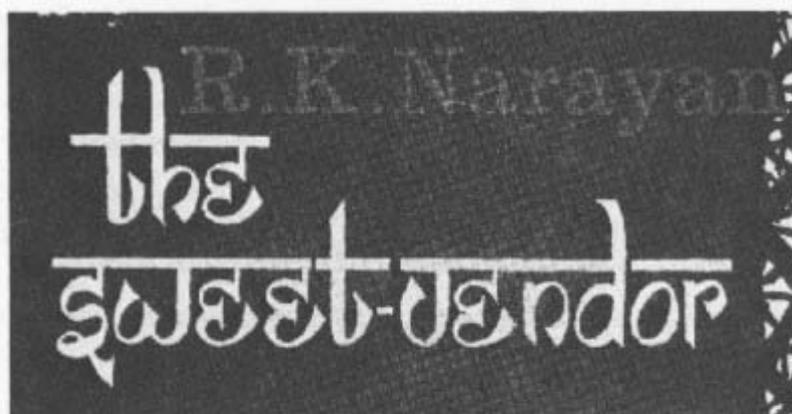


Figure 15. Detail of a Book Jacket Designed by Roy Spencer

we don't make an effort till we discover the deception and adjust to the message.[29]

I believe that if we approach the problem of pictures from this unexpected angle we may be able to sort out the problems that puzzled Professors Gibson and Wollheim. Clearly, almost any picture contains a good deal less information than the object it represents would exhibit. But there are many ways of making up for this deficiency, if we must regard it as such. One is here as always our knowledge of the world, of what Professor Gibson calls the ecology of our surrounding. It is such knowledge that enables us effortlessly to adjust to M. C. Escher's print of trees reflected in a pool of water (Figure 16),

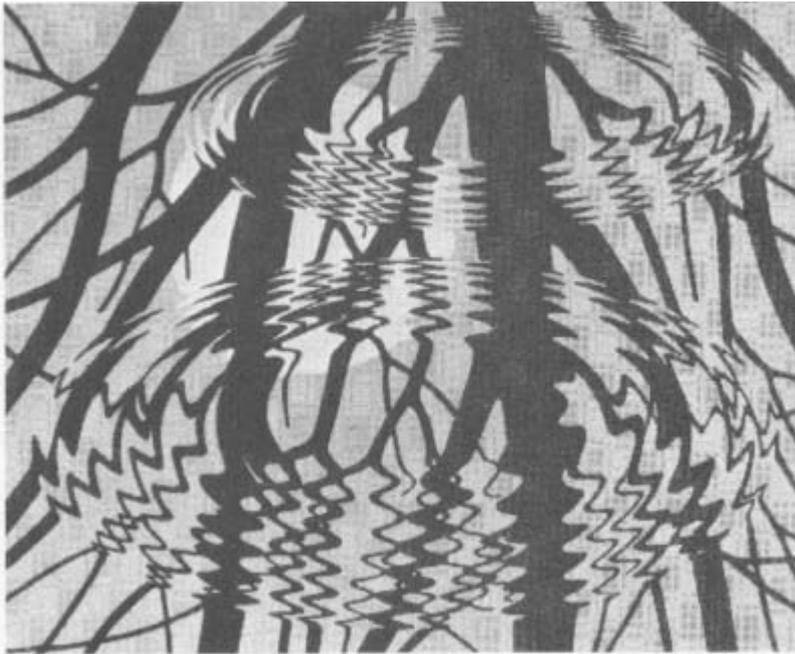


Figure 16. M. C. Escher, "Rippled Surface," linocut 1950

though when you come to think of it the operation required is rather a complex one, separating the construction of trees with straight branches from the action of the water on the image. Another print by Escher, called "Three Worlds" (Figure 17),



Figure 17. M. C. Escher,
"Three Worlds,"
lithograph 1955

carries this operation even further without causing us any difficulty in matching his forms from our experience.

The objective similarity between the prints and the situation they represent is small if you think in terms of elements. But it is strong if you think in terms of systems of relationships. It is to such systems, with all their effort-saving redundancies, that our processing is obviously geared. The variability of vision includes the capacity to adjust to fresh systems, provided we can learn their rules of transformation and invariance. Hence our construction can soon make allowance for any kind of systematic distortion, like the distortion of the water surface. That there is more to this adjustment than mere inference is shown by experiments with distorting, inverting, or colored spectacles which wearers gradually cease to notice, only to have to relearn the processing of undistorted information when returning to normal vision. Once more Escher shows us in another print (Figure 18)

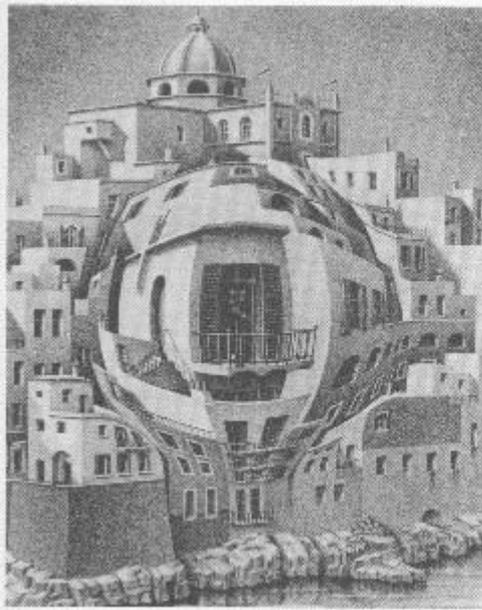


Figure 18. M. C. Escher, "Balcony," lithograph 1945

how even arrested distortion remains legible, since our knowledge of what is possible or probable in the visible world will guide us to a correct construction.

As long as we talk in terms of information, moreover, we need not be particular about the form in which the information reaches us. The whole wretched question of how many of the means of art are conventional and how many natural is reduced to its proper proportion. Language is conventional and yet transparent, and even the minimal information of a picture can become so transparent if context or description adds the required information

I have alluded before to the game invented by the Carracci and recently christened "Doodles," the abbreviated joke picture which only a caption makes us see. [30] Figure 19

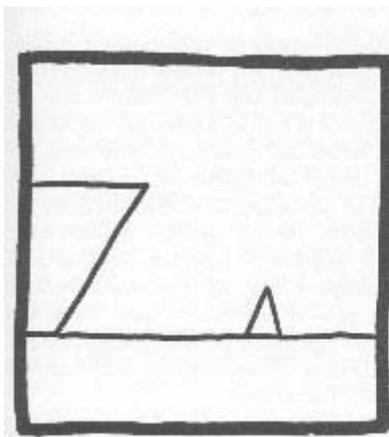


Figure 19. "Ship Arriving Too Late to Save Drowning Witch"

is called by its author, Roger Price, "Ship Arriving Too Late to Save Drowning Witch." Even such an absurd caption tends to settle on the configuration. I find it hard at least not to see the horizontal as the ocean separating the water from the sky. I can easily turn the witch's hat into the sugar-loaf mountain and see it recede into the distance. I find it less easy to eliminate the ship and the surface of the sea, for it is hard to think of alternative objects. Try to make it part of a runway (Figure 20)

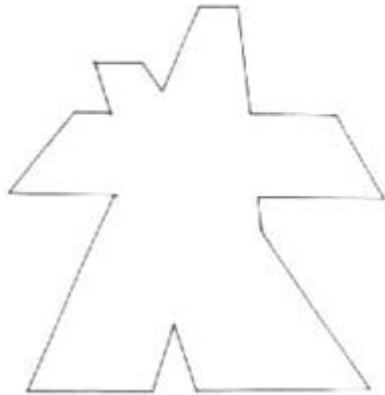


Figure 20. Airstrip

seen by a landing pilot through a rectangular window—an operation which involves a switch between figure and ground.

I believe that the training of art historians and art critics should include such exercises, not because the joke is all that good, but because it demonstrates one aspect of the variability of vision which must especially concern him, its obedience to suggestion. The word "evidence," of course, derives from *video* and implies that what lies in front of our eyes cannot and need not be questioned any further. But the point is here, as always, that visual evidence never comes neat, as it were, unmixed with imagination. The processing of visual information is impossible without this ingredient. Whether we are students of man-made images, of tracks left in the sand, or of intelligence photographs, we must scan the configuration for its message, for its meaning. In doing so we make ready to construct the answer from the elements of possible solutions we have stored. We are always trying for a fit, and this process can never be completely halted so long as our mind remains active. The perception of meaning can more easily be triggered than it can be eradicated, because it is automatic.

Take one of the most basic systems of visual information, that of facial expression, which conveys the moods and intentions of our fellow creatures. Surely it is these moods we perceive without being aware of the individual elements that contribute to our perception. On the contrary, awareness hardly succeeds in breaking the automatism of response. I have in mind the effects of one of the oldest forms of visual art, the art of makeup. We may know and even watch the transforming strokes of a lipstick or an actor's grease paint, but we shall still not be able to separate in our own reactions what we see from what we know. The information put into the face affects us willy nilly.

I believe, indeed, that this kind of automatism in the processing of information goes much further in the visual arts than I may have indicated in my book. Take the experience of Greek sculpture, which became so adept in conveying the feeling of the existence of a living body beneath the drapery (Figure 21).



Figure 21. Statue of Sophocles

I would maintain that it is truer to our experience to say that we perceive the body underneath the garment than to say that what we really see is only the variously buckled surface of a block of marble.

When we approach the problem of illusion from this angle, the distinction between the picture surface and the objects represented upon it, which has been so much discussed, becomes the distinction between the symbol and the information it conveys. While we scan a picture for such information the surface is irrelevant to our processing and disappears from our awareness. Once more we can leave the problem of illusion on one side and still say that the painting surface has become somewhat transparent to our mind, as transparent, at least, as has the written or the spoken word while we attend to its meaning.

We are all familiar with this experience—if not with the painted pictures, then with the images on the cinema or the television screen. When watching an exciting film we surely attend to the information rather than to the screen. The movie is altogether a good example of what I called automatic processing. We process the successive frames of the film as information about movement, and in this case we are quite unable to halt the automatism, which is partly physiological. We see movement, not a succession of stills, and similarly, I would maintain, we also see a man coming toward us rather than a configuration of shapes getting larger. The dark, of course, which blots out the screen helps to suppress the contradictory information presented by the surround; you can do the same with any painted picture if you screen off the frame and the wall with your hands or look at it through a tube. The distance of the painting surface will then be hard to establish and this will enhance the experience of depth.

Since I wrote my book I have learned an excellent term with which painters sometimes describe this experience which can even occur in normal conditions. They call it "losing the surface," a feeling they do not necessarily welcome. The so-called illusionistic picture easily makes us lose the

surface. Once more sculpture provides an interesting confirmation of this process. The pictorial relief presents a three-dimensional scene on a shallow but equally three-dimensional stage (Figure 22).



Figure 22. Benedetto da Majano, "The Confirmation of the Franciscan Rule"

Nobody, in looking at such a relief, will claim that it looks like reality, but if we ask ourselves whether we could draw the ground plan of the relief rather than of the intended stage we would soon find that this is hard. Our normal processing of information has been directed at the representation, and the actual shape of the relief has been lost from our full awareness.

The most dramatic device for losing the surface is of course the stereoscope. The stereoscopic picture provides the same kind of information as we derive from binocular vision. The disparity of the two images permits us to plot the objects of a certain zone in depth. Once more the automatic nature of this processing is apparent in the stereoscope: we don't know how we do it but we are compelled to perceive the objects with almost unpleasant solidity. I am interested in this experience because it easily illustrates the difference between an illusion and a delusion—we don't believe we see a solid object but we have the illusion of solidity.

Moreover, the stereoscope demonstrates that there is no qualitative difference between this experience and that of looking at a monocular picture. There are at least two arguments in favor of this assertion. One rests on the introspective account of what happens when you close one eye in looking at a stereoscope. Something of the feeling of solidity will inevitably disappear, but there is no dramatic difference between the one-eyed and the two-eyed vision, since most of the information you process remains of course the same. But, apart from this introspective feeling of similarity between the two-eyed and the one-eyed picture, there is also a logical argument in favor of the continuity between the processing of stereoscopic information and that of monocular information. Binocular disparity after all only provides effective spatial information about the foreground. The disparity dwindles with the distance and becomes imperceptible. Accordingly the

two images of a landscape produced by a double-lensed stereoscopic camera differ only in their foreground features, and it is these features only which can really be said to be perceived stereoscopically, that is, in three dimensions, when the two images are made to fuse in the stereoscopic viewer. Yet it would surely be untrue to experience to say that in this situation we can distinguish between those objects which are seen in "3-D" and those parts of the image which are flat. Here, as in real life, the gradual thinning out of information does not result in any discontinuity—the distance, too, appears to extend in depth. But since pictures of distant prospects produced by the stereoscopic camera are indistinguishable from those made by an ordinary monocular camera there cannot be a difference in principle between the way we see the resulting images.

We can thus return to the problems posed by Professors Gibson and Wollheim with some assurance that the divorce between the perception of pictures and that of reality which they advocated can never be carried out completely.

In particular it seems to me that Professor Wollheim's objections to the application of the term "interpretation" to our perception of the world and of the term "illusion" to our perception of pictures cannot really be upheld without running into difficulties. For what I have called the processing of information seems to me indistinguishable in many cases from what is usually known as interpretation. Surely there is no discontinuity between the intelligence officer's work as he is bent over his photograph and that of the airman on a reconnaissance flight. Both try to "make out" what they see, even if the airman has more chance of succeeding because he has additional information, which, by the way, can also be recorded through films and stereoscopic cameras. What both of them try to do is perhaps best explained by looking at the efforts to prevent a correct interpretation—they try to identify objects. It is this, of course, which the camouflage artist attempts to counteract by breaking up the contours of objects and making them merge with the ground. To be more exact, camouflage is intended to prevent the identification of particular objects. The enemy should see only familiar, innocuous sights—trees, ponds, rocks—and should reconstruct these normal things so automatically that his attention is not arrested by what is to be concealed.

Now the formulation that the interpretation of reality and that of pictures are both concerned with the identification and reconstruction of objects may at first sight look almost embarrassingly obvious. But what looks obvious is not necessarily simple. It is by no means easy to specify how we identify objects in our surrounding, though the psychology of perception is making great strides in this direction. All I need for my purpose is the hypothesis that the isolation and reconstruction of an object is an operation in time which for all its rapidity is certainly complex.

It seems to me demonstrable that this operation also comes into play when we look at representations of objects on a flat surface.

There are several arguments in favor of this assertion. One of them is the puzzling effect of those configurations known as "impossible figures" which we also owe to M. C. Escher (Figure 23).

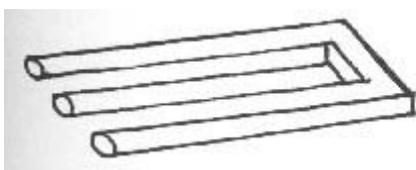


Figure 23. "Impossible Figure"

The very discomfort they cause us, I would contend, is due to the compulsion to read them in terms of a three-dimensional object which, as we soon discover, leads us into contradictions.[31]

It looks indeed as if the description of such an experience in terms of the processing of information will get us further than other descriptions.[32] We start somewhere along the contour and make certain assumptions which are proving invalid; we start again and are stumped once more. Some of the discomfort disappears if we shorten the process and allow the eye to take in more of the configuration at one glance (Figure 24).

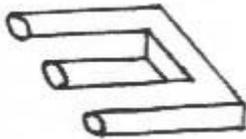


Figure 24. "Impossible Figure" Redrawn

We then discover quickly where the inconsistent switch is located; apparently the difficulty of matching successive fixations was at the root of the original difficulty. There may be other variables as well. I believe that if we keep the distance but vary the length of the individual rods (Figure 25) we are a little less easily taken in.

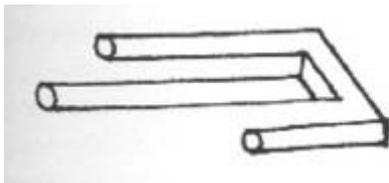


Figure 25. Another Version of the "Impossible Figure"

It looks as if the similarity of the apparent rod endings tricked us into accepting the three as alike altogether. But, whatever the analysis of the experience may add, one thing is clear: if the apparent solidity of the figure did not trigger automatic processing, we would feel no puzzlement. We cannot so easily see the configuration in the plane. In fact, I find it even hard to copy it.

What this experience suggests is that the reading of a picture is indeed a reaction in time which involves certain specified operations.[33]

The question we have to answer is really whether or not these operations are at least analogous to certain equally automatic operations which are connected with our perception of the visible world. This was the point I took for granted in writing *Art and Illusion*, and it is a position I still want to defend.

I must apologize if I here return to an example I have discussed elsewhere (Figure 26);

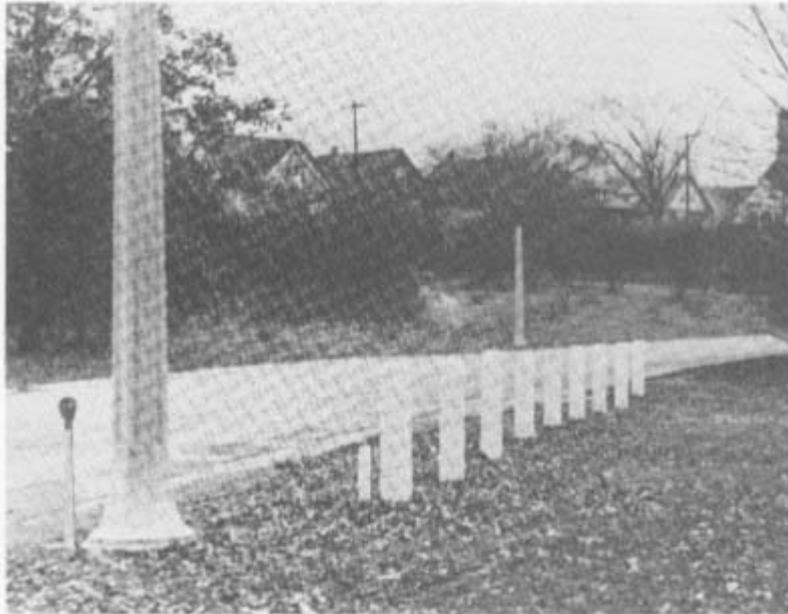


Figure 26. Ralph M. Evans: A Demonstration of Size Constancy

it is a little experiment I owe to a book by Ralph Evans[34] I think I have learned more from this simple trick photograph than from many a book on perception. It is a demonstration of the so-called constancy phenomenon, the observation that we underrate the effect of distance on size and see a row of posts or houses relatively of the same size despite perspective diminution. Now the constancy phenomenon itself has become much less surprising since Professor Gibson's analysis of our perceptual world. If the lampposts or posts are of the same size, we have enough information about them also to perceive them as identical. Remember that the information present in the optic array really is generally sufficient to allow us to perceive what is there. But that this also holds good in a picture which cuts down this information to a fraction seems to me much less obvious. And yet Evans has proved it by a simple trick. He has transferred the lamppost also to the front and placed a replica of the last post next to the first. We cannot believe our eyes and have to resort to measurement to convince ourselves that on the picture plane the two are really identical.

I think this little experiment proves indeed that we feed the information from the picture plane into the same kind of mill into which we also feed the information from the optic array. And because it is a mill, a process, an operation, it is not easy to halt. I would not say and never did say that we could not halt it up to a point, and view the picture plane as such. What I doubted and continue to doubt is that we can do both at the same time. We cannot, for the same reason that we cannot speak or write two different words at the same time.

But does not this demonstration prove too much? Is it not a fact that we are not under the illusion that we see a road extending into the background? Are we not always aware of sitting or standing in front of a picture? Of course we are. The illusions caused by this operation are again not delusions. And yet I would admit that there is a problem here which I should like again to illustrate with a print by M. C. Escher, whose work presents so many interesting comments on the puzzles of representation (Figure 27). [35]



Figure 27. M. C. Escher, "Print Gallery," lithograph 1956

He shows us the boy in the print gallery both outside and inside the picture of a harbor. He never quite loses the awareness of where he is, but he is still engrossed in what he sees. While he reads the print, and insofar as he reads it he must construct and make out, he must give the processes of matching from experience free rein, and I doubt if he can do that while concentrating fully on the surface arrangement. We cannot perform two different operations simultaneously with the same message. This does not mean, however, that we cannot process different messages at the same time. Of course we can. We can all listen and look; if we could not, we could not give illustrated lectures. We can also process different types of visual information at the same time, pictures and captions or galleries and paintings. There are indeed situations in which our responses to various sets of visual information must be kept marvelously distinct.

The driver of a motorcar has no difficulty in distinguishing between the information that reaches him through the mirror and the other that he picks up across the windshield. More surprisingly still, because more closely linked to motor reactions, the dentist learns to adjust his movement to the reverse picture he sees in the mirror and to the surround he sees normally. Here, as always, the plasticity of our processing capacity is astounding.

But let us remember again that such feats of perceptual skill would not be possible if the information which reaches us from both sources would not exhibit the same kind of systematic redundancies which mark all efficient systems of information. It is these redundancies we learn to disregard in our search for meaning, thus freeing our conscious capacity for the resolution of doubts. In hearing, this selective attention is called listening, in seeing, looking. Looking means focusing, physically and mentally, and this capacity must in the nature of things be limited. How limited we are in the simultaneous processing of visual information is a question which the student of art must hand over to the experimental psychologist. He would need his co-operation badly, for it lies in the nature of art that it presses against the limits of our mental capacities—both in the direction of increasing refinement and discrimination and in that of richness and complexity. Thus

the visual arts have taken on the role of exercises in the variability of vision. The artist, at least the modern artist, is engaged in a constant fight against the automatisms of perception. He certainly does not want us to look through his representation at what is represented: he does not want his picture to trigger responses which belong to reality.[36] I believe in fact that the resistance against any assertion of the kind I have been making is due to the wish that things were different. I have more or less refrained from discussing works of art precisely because the artist wants us to attend to his art. Neither does the poet want his words to become transparent for us so that we disregard their sound for the sake of the message. All art needs an awareness of form.

It is the discovery of this need which has increasingly been used by aestheticians and philosophers to decry those processes of everyday perception which bypass our conscious awareness. We are told to get out of this bad and lazy habit and to learn to see. I think we owe a special debt of gratitude to psychologists, such as Gibson, who have taught us to marvel at the subtlety and richness of the senses as perceptual systems. To abolish their operations for the sake of a pretended innocence and self-awareness would result at best in the paralysis of the proverbial centipede who was asked to take care which of its hundred legs it moved every time. Of course, you can throw a spanner into the marvelous works by paralyzing some of the operations—which is, I believe, the main effect of those dangerous drugs which a foolish philosophy has described as opening the doors of perception. Maybe they sometimes slow down the automatism and therefore change the appearance of the world, breaking down the constancies and enhancing the awareness of color and shapes.[37] We can get that more cheaply and innocuously by looking at a landscape with head down between our legs.

The way to art does not lie through mechanical tampering with our brain or our senses. It is true that the artist may be in need of slowing down and observing the process of vision, but he can do so, I believe, only through the discovery of fresh interpretations, fresh meanings. We are so made that we can instruct and retool our perception to the finest points which interest us. If that were not so, neither the perception of language nor the miracle of reading would be possible. Both, I believe, use the mechanism that may have enabled the primitive hunter to discover and follow those tracks with which I began my paper. The interests of the civilized human being are perhaps less intense, but they are manifold, and so his vision is more variable. Of course, we all see the same world, but we learn to attend to different aspects. With luck I may have performed such an experiment, at least I hope that some of us, when next we take a walk, will suddenly see trees with different eyes. We may ask ourselves how much of their shape we could reconstruct, and as we pass them we may watch the intricate dance of their branches and twigs revealing their direction at least partially to the attentive eye. Maybe we will be reminded of mobiles and other forms of kinetic art which may indeed have enhanced our capacity to code and construct these complexities by presenting us with simpler models. So far I should certainly like to go along with Professor Gibson's tribute to the powers of art. And if my experiment succeeds it should also suggest the reason why the variability of vision is purchased at the price of exclusiveness. Sometimes, as the proverb says, we cannot see the wood for the trees, sometimes the wood replaces the trees. The richness of the optic array allows of an infinite number of interpretations as we scan this world of ours for meaning, whether we are naturalists or intelligence officers, students of vision or students of art.

- [1] E. A. R. Ennion and N. Tinbergen, *Tracks* (Oxford: Clarendon Press, 1967).
- [2] Karel Capek, "Der Fußstapfen," *Gottesmarter* (Berlin: S. Fischer, 1918); the idea is derived from David Hume.
- [3] E. H. Gombrich, *Art and Illusion: A Study in the Psychology of Pictorial Representation* (New York and London, 1960), chap. VII.
- [4] David Irving, *The Mare's Nest* (London: Kimber, 1964).
- [5] *Ibid.*, p. 66.
- [6] *Ibid.*, p. 60.
- [7] *Ibid.*
- [8] *Ibid.*, p. 67.
- [9] *Ibid.*, p. 260.
- [10] Ulric Neisser, *Cognitive Psychology* (New York: Appleton-Century-Crofts, 1967), pp. 94-95.
- [11] E. H. Gombrich, "Zur Psychologie des Bilderlesens," *Röntgen-Blätter*, 20 (February, 1967).
- [12] I take this example from the instructive book by Ralph M. Evans, *Eye, Film and Camera in Color Photography* (New York: John Wiley & Sons, 1959), Figs. 2-11 and 8-9.
- [13] Franklin P. Kilpatrick, ed., *Explorations in Transactional Psychology* (New York: New York University Press, 1961).
- [14] Edwin G. Boring, *Sensation and Perception in the History of Experimental Psychology* (New York and London, 1942).
- [15] For a recent statement, see K. R. Popper, "Is There an Epistemological Problem of Perception?" in *Problems in the Philosophy of Science*, ed. Imre Lakatos and Alan Musgrave (Amsterdam: North Holland Publishing Co., 1968), pp. 163-64.
- [16] James J. Gibson, *The Senses Considered as Perceptual Systems* (Boston: Houghton Mifflin Co., 1966).
- [17] *Ibid.*, Ills. and Figs. 10-6, 10-7, 10-10.
- [18] Julian E. Hochberg, *Perception* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964), who also adopts much of Gibson's point of view, also poses the problem of whether his explanation does not prove a little too much.
- [19] Richard Wollheim, "Art and Illusion," *British Journal of Aesthetics*, 3, no. 1 (January, 1963): 15-37.
- [20] Richard Wollheim, *On Drawing an Object* (London: University College, 1965), an inaugural lecture delivered at University College, London, on December 1, 1964.

[21] Emmet N. Leith and Juris Upatnieks, "Photography by Laser," *Scientific American*, 212 (June, 1965): 24-35; Keith S. Pennington, "Advances in Holography," *Scientific American*, 218 (February, 1968): 40-48.

[22] Gibson, *op. cit.*, p. 303.

[23] For a parallel account (by G. K. Adams) see my *Art and Illusion*, p. 226.

[24] M. D. Vernon, *A Further Study of Visual Perception* (Cambridge: At the University Press, 1952), p. 145.

[25] I take the illustration from Winston S. Churchill, *The Second World War* (London: Cassel, 1950), opp. p. 394.

[26] Neisser, *op. cit.*, p. 137.

[27] *Ibid.*; the illustration comes from Fig. 9, p. 47 (after O. G. Selfridge, "Pattern Recognition and Modern Computers," *Proc. West. Joint Computer Conferences* [Los Angeles, Calif., 1955]).

[28] I take this example from a talk given by Professor Abraham Kaplan at Harvard University in 1959 and can confirm it from my own experience.

[29] The dust jacket of R. K. Narayan's *The Sweet-Vendor*, designed by Roy Spencer (London: Bodley Head, 1967).

[30] Gombrich, *Art and Illusion*, chap. VII; Roger Price, *Doodles* (London: W. H. Allen, 1954), Plate 56.

[31] See E. H. Gombrich, "Illusion and Visual Deadlock," *Meditations on a Hobby Horse* (London: Phaidon, 1963), and Gibson, *op. cit.*, p. 248, Fig. 11-8.

[32] It is admittedly tricky to discuss this operation without being pushed into the discredited distinction between the raw sense data on the one hand and their product in perception on the other. It is understandable, therefore, that the desire to avoid such a distinction has tempted both philosophers and psychologists into the opposite position, which asserts that we do not "infer" the world, we simply perceive it. Such phenomena as the "constancies," which intrigued earlier psychologists because they presented an unexpected deviation from the data of sensations, become on this view the normal condition of perception, which is directed toward the invariant features of our environment. According to this view, a man in the distance does not "appear to be small"; he looks his size, and only a derivative "pictorial attitude" discovers the change in his "apparent size."

In a recent discussion of my book *Art and Illusion* at Cornell University in September, 1967, Professor Gibson rightly and gracefully pointed out that I had talked about Pygmalion's power but had omitted the experience of Narcissus, the discovery of the virtual or "apparent" image which fostered what he calls the "pictorial attitude." I gladly accept this challenge, for, as I tried to hint in the text of this essay (p. 52), the viewing of a reflection indeed offers an excellent example of what I mean by a perceptual operation. We can separate the distortions due to ripples from the object we contemplate: we look across the appearance at a reality. But is it true that such an awareness of the difference between appearance and reality occurs only in such exceptional circumstances? I remember from my childhood days how puzzled I was to find that the courtyard

into which we looked from the sixth floor of our apartment looked much smaller from the ground floor than from the bird's-eye view. The change of appearance intrigued me before I had ever learned the pictorial attitude. But, even if this kind of which cannot be perceived "as they are"—the moon for instance. Yet we all know that the moon looks larger close to the horizon than it does high in the sky. The most likely explanation of that much-discussed illusion is surely the one which connects the apparent size with its apparent distance—paradoxically, the moon looks larger when it appears to be farther away because the same object when farther away would have to be larger to subtend an identical visual angle. It is this kind of automatic processing which I have in mind when I speak of a perceptual "operation." The estimate of distance reacts on the estimate of size, both in reality and in the viewing of pictures. What is "given" in reality is only the visual angle; what appears in our awareness is the product of this analysis, which splits up the "given" (of which we know nothing) into an object and its modification through its relation to us. There is a parallel operation performed in the separation of color and illumination. The light reflected from an object is treated as the product of its invariant or so-called local color and the color of the light. I have argued in a lecture I gave at Cornell on the occasion mentioned above that the same applies to our interpretation of facial expression, where we must separate the invariant form from the expressive movement. Perhaps Chomsky's distinction between "surface structure" and "deep structure" in the perception and understanding of language points to a similar two-step process in our reconstructive activity. Unless I misunderstand the situation, this two-step process is built into the very fabric of perceiving and reaches down to near-physiological levels. The Land experiments on color perception at least appear to suggest that in favorable conditions our perceptual system can establish a median against which the distribution of light frequencies is plotted, regardless of the objective color of the light that stimulates the retina. Heterogeneous as the phenomena here enumerated may seem, they all point to the role of interpretation at the heart of the perceptual operation and are therefore relevant to the topic of this paper.

[33] Herbert A. Simon, "An Information-Processing Explanation of Some Perceptual Phenomena," *British Journal of Psychology*, 58 (May, 1967): 1-12.

[34] Ralph M. Evans, *An Introduction to Color* (New York: John Wiley & Sons, 1948), p. 149. I have used this example in "Visual Discovery through Art," *Arts Magazine*, November, 1965.

[35] "Illusion and Visual Deadlock"; see note 31 above.

[36] Gombrich, *Art and Illusion*, chap. VI; *idem*, "Psycho-Analysis and the History of Art," *Meditations on a Hobby Horse*. It is at this point, perhaps, that this paper links up with my lecture to the American Psychological Society, "The Use of Art for the Study of Symbols," *American Psychologist*, January, 1965, where I discuss the traditional problems of "form" and "content" from the point of view of simultaneous information processing.

[37] I have never taken hallucinogenic drugs and do not intend to do so, but some of the descriptions I have read and heard of what are experienced as "heightened" perceptions fit in well with the hypothesis that the integrative actions of the process are impeded. Instead of achieving a perception of invariants, the person under drugs may see the same variations due to illumination and distance which interest the artist. He may even fail to keep the world stable through "feedback" when moving his eyes and thus see swinging patterns streaking past. The interpretation that such experiences tear the veil from reality and restore some mystic immediacy is understandable but also sadly naïve.