

Tribute to Colin Cherry given at Imperial College, London, January, 1995.

I am extremely grateful to Professor Spence for giving me this opportunity of paying tribute to the memory of Colin Cherry to whom I owe a very great deal. Alas, it was only in preparing this talk that I also came to realise that in announcing my title I had set a trap for myself. I cannot speak about my debt to him without recapitulating pages of my books. What is worse, in describing myself as an art historian I may have raised the hope that you will soon see on this screen a beautiful painting by Rembrandt which Colin Cherry's thoughts enabled me to discover in a dark attic, and subsequently to sell at five million pounds, which is what Art Historians are generally supposed to do. Alas, if there ever were such art historians I have never been one of them, and if I was able to benefit so much from my contact with Colin Cherry the reason must be that the problems that concerned me in the history of art were of a less practical and less profitable kind.

You may well wonder how an art historian of any kind came to draw inspiration from the achievements of a prominent member of this college. I suppose, as so often in life, coincidence played a part.

For a time in the fifties I held a part-time Chair at University College London, as Durning Lawrence Professor, to teach art history at the Slade. I believe it was around that time that the college wished to acquire the library of K. Ogden, who had collaborated with I.A.Richards in writing *The Meaning of Meaning*. Naturally funds were short and some formal reason had to be put forward to convince the authorities of the obvious, that these books would be an asset to the library. So the Provost of University College, Ifor Evans, invented the project of a Communications Research Centre, and to the best of my recollection it was in this context that contact was made with Colin Cherry.

This contact would perhaps have been less easy and less profitable but for an admirable institution which I believe still exists, though not, perhaps, with the same sense of mission. I refer to the week-end conferences at Cumberland Lodge in Windsor Great Park which owed much to the vision of Sir Walter Moberly and to the energy of Miss Amy Buller, and last but not least to the Queen Mother who placed one of her "Grace and Favour" residences at the service of their idea to establish a place where undergraduates of the so-called red-brick universities - for those were the days before ferro-concrete universities - could meet and mix informally with students and staff of other departments or faculties, as they did, allegedly, in the colleges of Oxbridge.

I became an early and pretty frequent participant at these meetings where I certainly met more academics of various fields than I ever did during my spell as Slade Professor in Oxford or Cambridge. It was at Cumberland Lodge that I got to know J.B.S.Haldane, Peter Medawar and Donald McKie, and I am pretty sure that I also met Colin Cherry there for a first time, probably at a week-end connected with that Communications Research Centre, though also on other occasions. I think he came to the European Forum of Alpbach in Tyrol devoted to linguistics, and I remember gratefully that he even invited me to speak at his Seminar here at the Imperial College. I recall that I had intended to use a projector, and that the apparatus played its usual tricks and would not function, whereupon Colin Cherry called into the audience "is there perhaps an electrical engineer in this place?". There was, and we were able to proceed.

When I gave my Inaugural Lecture at University College in February 1957, I paraphrased a sentence I had read in Colin Cherry's writings: "symbols do not carry meaning as trucks carry coal. Their function is to select from alternatives within a given context." and I illustrated the remark with the episode from

the story of Ali Baba and the Forty Thieves. The robber had marked one door he wanted to remember with chalk, but his fair opponent, who had observed him, took chalk and repeated the sign on all the other doors, thus destroying the meaning of the symbol without touching it.

I sometimes come back in my writings to this selective function of symbols because this insight helped me to criticise what was, and still may be, a dominant theory of expression in aesthetics, the theory of art as expression. Though this theory takes many forms it never gets far away from the idea that the shapes and colours an artist puts on the canvas "carry meaning" (in Colin Cherry's words) as railway trains carry coal, to be transmitted to the responsive viewer.

If I may oversimplify, for the sake of brevity, it holds that the colour red will always be charged with a particular emotion which we will come to share if we look at it.

But a moment's reflection shows that red like any other colour can be given a selective emotion, for instance in traffic lights, but by itself it has no meaning. A red letter day may be a festive day in the calendar, but being in the red with one's bank account is not so cheerful.

I would not say that the choice of red in these and other contexts is entirely random, but you will understand that the scientific Theory of Communication I got to know through Colin Cherry made me see how careful we must be before identifying art with communication. I also came soon to realise that this theory had even wider applications to the study of art and perception with which I was concerned.

And if you turn to the Preface of my book *Art and Illusion* which is subtitled a study in the Psychology of Pictorial Representation, you will then find that in 1959 - thirty-six years ago - I gratefully acknowledged that conversations with Colin Cherry gave me what I called "tantalizing glimpses of the exciting fields of information theory in linguistics". Tantalizing, because I was and am only too much aware that I would never master the mathematical foundations of that theory.

Meanwhile, in 1957, Colin Cherry had published his books on Human Communication entitled "a Review, a Survey, and a Criticism" and so endearingly dedicated "to my dog Pym". I dared to assume that Pym did not know more mathematics than I did, and when, decades later, I wrote my heavy tome *The Sense of Order: a Study in the Psychology of decorative art*, I felt emboldened to base the substantial section dealing with the perception of pattern on what I had been able to grasp of that theory; the point, you remember, that it is the function of signals to select between given alternatives and thus to reduce the doubt in which the recipient had found himself.

A simple but imprecise example from daily life seemed appropriate: The situation of an anxious father waiting for the message whether it is a boy or a girl. All an English speaker would have needed to resolve this doubt would be a letter b or g, all the rest would, in the technical sense, be redundant. I have called it an imprecise example because, strictly speaking, the two alternatives would not be equiprobable but would depend on the statistics of live births. Moreover this would not be the only alternative, for, to exclude more divers eventualities, he might have become the father of twins, triplets or whatnot. But though I wonder if the probability of this event could be quantified, he would surely have the right to be surprised, and more so as the numbers increased.

It was this commonsense observation that gave me the courage to proceed along this path without the equipment of mathematics. I was prepared to do so since the clash between the expected and the

unexpected is also central to the philosophy of my friend Karl Popper to which I shall have to return at a point where I found Cherry's and Popper's views slightly in conflict.

But quite apart from these somewhat esoteric issues I should say that I did not come quite unprepared to a theory worked out by communication engineers. I never worked with the receiving of radio messages of foreign radio transmissions in the Monitoring Service of the BBC. Thus it was not hard for me to understand the role of redundancy in language to defeat noise. Knowing a language enabled you to reconstruct the message with a high degree of accuracy, in hearing precisely as in reading. I show you a slide from a textbook of psychology (Sense of Order, 17a) which you will have no difficulty in reading, and you may be surprised to discover how much of these signs has been obliterated by the blot (17b). Had there been an unknown name beneath the blot, you could not possibly tell, and the same was true with hearing, when we monitors tried in vain to transcribe the name of villages captured or of officers decorated.

Strangely enough, very analogous problems concern the art historian, or at any rate the archaeologist, for what noise is to messages, decay is to monuments of the past. Whether we want to reconstruct them physically, or only in our minds, we must rely on our previous knowledge of conventions, and most of all on such redundancies as are present in the styles of the past (Trier, Nonnus mosaic). We can actually grade the difficulties encountered by the restorer charged with such a task, of which I show you an example or two. When he is confronted with a repeat pattern he feels confident that he can fill any lacunae, though of course there are cases when he may be wrong (Alcazar, decoration). We are all archaeologists when we attempt to remember the past and to reconstruct a memory. Once more we know to what extent the artifice of redundancy facilitates the task. How infinitely easier it is to remember a poem than to remember prose, for in poetry rhyme and rhyme narrow down the possibility of what it might be. The jingle "an apple a day keeps the doctor away" may be silly, and certainly wrong, but how much more easily it is remembered than more scientific nutritional advice!

What I am driving at is the elementary fact that order can be seen as a form of redundancy, repeats being, of course, the highest form of such order as in SOS SOS, or testing testing.

Long before the human race appeared on the earth evolution had led to the development of such orders to defeat noise. I refer to the signals sent by insects, the quacking of frogs, or the repeat pattern of birdsongs which are likely to come through while the leaves or the wind howls.

It has been observed by naturalists that the markings of animals must have developed for similar reasons (duck markings), for their survival values. They are easily recognised by potential mates and arouse attention. We also know that evolution has exerted pressure in the opposite direction, that of camouflage (Red Grouse), when the creature blends with the random colour of its habitat and becomes all but invisible.

We cannot go far wrong if we suggest that the strong patterns of markings like the repeated signals attract attention because they look unexpected in the context of the habitat, while the camouflage simulates the expected markings, and is therefore hard to perceive. Remember that the expected is equated with the redundant and the unexpected with information in the technical sense. But just because this analogy is tempting, we must not leave it unexamined. Intuitively it is certainly true that to encounter ordered configuration in nature is all the more startling the more random or chaotic the surround may look, but in what sense does this give us the right to call it less probable?

In my book on *The Sense of Order* I took as illustration the cartoon from the *New Yorker* which I show you here. It shows, of course, an action painter hurling paint onto canvas in a frenzy, only to discover to his horror that what he had produced was a replica of Whistler's *Mother*. We all agree that he was unlucky and that this is extremely improbable ever to happen. To be sure it is, but would also have been the result of random forms hard to calculate in advance, but since we would have simply categorised it as a blot among other blots we would not have asked about its probability. It is different with an ordered or recognisable arrangement which we would find unlikely to come about by chance.

In my book I tested this belief with the standard example of the probability calculus, the tossing of a coin, where we consider head or tail is of course $\frac{1}{2}$. In my diagram I marked ten throws, tails were black, heads white. The probability of all ten being either black or white is two to the power of ten equalling 1024. This never happened in my experiment, in fact the sequences, as you see, were mostly irregular. Only two of my ten sequences exhibited what one might call an order, the ninth a sequence of ten alternations, the tenth a neat symmetrical arrangement of three whites framed by two blacks on both sides of the axis.

Needless to say these results were exactly as improbably as all the others, but now we see that while a particular order cannot be called more improbable than a random sequence, order as such can be so described. It happened only in two out of ten sequences. Disorder as such is likelier than order, *quod erat demonstrandum*.

What arouses our attention, so it seems, is neither order nor disorder as such, but any transition from one to the other.

The regular shapes of flowers (after Frisch, *The Dancing Bees*) are known to arouse the attention of the pollinating insect that obviously scans the field for such breaks in the random distribution of grass. Conversely, take any orderly arrangement, such as a sequence of identical beads, and we are likely to be arrested by the break in the order (*Sense of Order*, fig. 122): here it is the spot where the gradient is interrupted that creates the accent. Our perceptual system often behaves as if it quickly learned and grasped any type of order or rule and soon responded to it as if it were redundant. We do not have to attend to the weave of the fabric because we soon take it as read, as it were, and so we save our energy for the deviation, be it a break or a fault in the weave.

I believe there are many examples which support such an interpretation. The pilot in his cockpit or the mother sitting by the side of her baby soon ceases to hear the regular engine noise or the rhythmical breathing of the child, but any break in this monotonous sequence will alert the brain because it may require action.

It may indeed be argued that the main devices all arts have in common rest on this principle: I refer to what we call an accent, and what we call composition or articulation.

Whatever art we may think of - poetry, music or architecture, you will everywhere find the tendency to balance the rule against the deviation and thus to engage our attention without confusing us.

You find this principle at work in any style or tradition. The repeats and redundancies have to be broken by discontinuities, whether you look at buildings in London or in Japan (British Museum façade) (Japanese temple, Nara), and the same, of course, applies to the shaping of a fine piece of furniture (table de chevet, Paris, Louvre), or take printing: In whatever language or font a title page is composed (Winckelmann title page, 1764), you will find this careful grading which we also know from

medieval MS and from the Winchester Bible. Conversely, as you see, those parts of the page without any break easily lead us to lose the place in the line, an error frequently made by tired copyists.

In this sense the accents, the graded complications of order by no means only serve an aesthetic need. Look at this slide of Centre Point and imagine someone telling you that his or her office is on the eleventh floor. Trying to locate it you will easily lose the place unless you put a marker somewhere. Another illustration of my point - I almost said of my Centre Point - that it is the discontinuous which arouse our perceptual system while monotonous sameness sinks below the threshold of awareness.

I have spoken in this context of the tendency of our mind to gamble on continuity assumption that you can attend to fresh impressions, including, I hope, my words. It is easy to show, however, that this gamble may occasionally mislead, and make us perceive continuation which we merely expect. I know no simpler demonstration of this tendency than the pattern I show you (titles like plaited ribbons, Sense Of Order, fig.). Most of you will probably see it as interlaced ribbons, but objectively you see only an arrangement of horizontal and vertical rectangles. It is the continuity assumption that makes you see them as weaving behind and on top and even slightly bending, which is an illusion.

I believe that more complex visual puzzles that have recently attracted attention can also be explained along these lines. Take the configuration sometimes known as the Devil's Tuning Fork (Sense of Order, fig. 133a.) invented, I believe, by Penrose. From whichever side we start reading it we get into trouble: start on your left with the three rods and you will be just as perplexed as when you start on the right with the solid frame. We cannot easily find how the switch occurs, unless we introduce an artificial break (fig. 133 b.) or shorten the rods to mere stumps (fig. 133c.) as I did in this illustration. What this and other teasers strikingly demonstrates is precisely the role which assumptions play in our perception.

I am happy to find myself here in complete agreement with Richard Gregory, my predecessor in this lecture series, who will also honour me by pronouncing the vote of thanks tonight. I know he will forgive me if I illustrate this indispensable role of assumption with yet another example that also concerns my interest not only in the perception of pattern, but also the reading of three-dimensional images.

Take this drawing of an interior (Sense of Order, fig. 124) entirely covered with a checkerboard pattern. Most of you, I believe, will see it as a furnished room seen in perspective, we see the floor as level and the ceiling parallel to it and understand the shape of these boxes or trunks placed there.

It takes a moment to realise that this reading depends entirely on the assumption that all the spaces are indeed square and identical in scale. On this assumption, of course, those we see diminishing in size by degree are receding from us, while any break in these regular gradients indicates a corner.

As soon as you drop this assumption and concede that the squares may also be rhomboids of any kind really diminishing in scale, the reading of the interior collapses and we just cannot tell what we have in front of us. If you think this is a far-fetched idea, remember any illusionistic stage design where floors and ceiling may indeed converge to create the impression of greater depth. I realise that caution is always needed before applying these artificial constructs to our everyday perception of real space.

And yet an analogous assumption can also be shown to guide our perception of nature when we confront a uniform lawn or dune (sand dunes) - not only in a photograph but in real life. We assume that the far wavelets in the sand are similar on the average and that their apparent diminution is due to their increasing recession away from us. Gregory has frequently stressed that, in theory, making use of assumptions, of hypotheses, our perception anticipates the procedure of science. For the scientist also operates with assumptions, with hypotheses which he seeks to test by observation.

I have learnt from Karl Popper that here in perception the tests that disprove an assumption are the decisive ones - for it is at such moments that we learn something new.

However often we look out of our windows we may still accept the belief that the earth is flat, but as soon as Magellan sailed around the globe that comfortable assumption had to be discarded once and for all.

What I have learnt from Popper is not only the decisive disparity between confirmation and refutation in this process, but, most of all, the importance of framing an initial hypothesis which is, on the face of it, unlikely to be correct. Because it is such an assumption, it stands a good chance of clashing with our next observation, and being eliminated for good and all in favour of another try.

The history of cosmology offers a textbook example I have also used. The ancient Greeks started from the assumption that the heavenly bodies move in circles, an assumption that even Copernicus adopted in proposing his heliocentric system. It was Kepler who had initially accepted this idea but found that it clashed with his observations of the planet Mars. It may have been lucky, but in adopting the next-simple model, the assumption of elliptical orbits, he hit on a hypothesis that fitted all observations.

In profiting from this analogy we may come closer to understanding the value for your survival of what I have called the continuity assumptions of our perceptual systems. As we have seen they offer a testing ground, as it were, for any novelty that contradicts them.

I have suggested somewhat boldly in my writings that quite generally the bias for simplicity in our perceptions that was first explored and illustrated by Gestalt Psychology may prove to have such a survival value not because the world tends to be simple, but precisely because this bias will show up the vital deviation from simplicity.

If you accept this reasoning you will also appreciate why I have felt compelled to side with Popper on an issue also raised in Colin Cherry's book.

Briefly the issue concerns the explanation of the tendency I have discussed, the question of why we tend to gamble on continuities, or whence we derive those assumptions which play such a decisive role in our mental life. Colin Cherry appears to think that it is past experiences which so influence our mind, in other words, he accepted the traditional answer that both in perception and in science we rely on what is called induction, the method of inferring from the frequent occurrence of events that they are likely to occur in the future. True, in his chapter "On the topic of communication" Cherry fully accepts the criticism of this procedure first put forward by David Hume in the eighteenth century, the criticism that there is no valid reason for such a forecast, but like so many other philosophers, Cherry argued, strictly valid or not, the method is all we have.

Now Popper has been a passionate critic of this argument ever since he published his fundamental book called *The Logic of Scientific Discovery* in the thirties. What Popper came to deny is that we can ever speak of similarity as such without specifying in which respect two items are similar. The simple diagram (diagram, p.421) from his book may suffice to illustrate this vital point: The shapes on the page can be read from left to right as similar and equally from top to bottom. You might introduce any other qualities or grouping, it always should become clear that it is we who categorise them, we who select the criteria of similarities at any one moment. The term similarity as such makes no sense and thus the claim of inductive inference from the similarity of events falls to the ground.

Nor, as you may remember, did Popper consider it damaging to science to give up this shaky method, for to learn something about the world we must test our assumptions and eliminate those that prove false. Where these original assumptions originate is not a question science needs to ask. They may have been random or systematic, stupid or clever, they all must submit to the same rule.

I should like to sum up that argument by applying it to that continuity assumption of which I spoke before.

Take, again, any chequered surface (*Sense of Order, Checkerboard, fig. 142a,*) such as a chess board. We are quickly aware of its simple order, but in testing it for continuities we are apt to take any of its prominent configurations and scan for their continuity (*fig. 142 b.*), they may be black or white diagonal, or black crosses around a white square or white crosses around a black square. The chessboard answers to all these tests of continuity till we come to the border. Which we take seems to depend on the accident of our first glance. Through we can also adopt one of these readings by choice.

Primitive as that example may be, I wanted to conclude with it, because it enables me still to introduce an important notion you also find discussed in Colin Cherry's book, I refer to the notion of MENTAL SET, the range of expectations we entertain at any given moment. Unlike the inspection of the abstract configurations I showed you, these temporary expectations depend, of course, on our education and our cultural heritage.

We expect to hear or read different sounds when we are set to respond to different languages. When you see the letters PAIN and expect that they make up an English word, you naturally read PAIN. But when you look at a French menu you are set to process the characters differently and read Pain et couvert.

Here, at last, I come back to the beginning of this lecture and the different way we respond to the colour red when we consult a calendar and when we receive our bank account. Every social institution has its own conventions and we adjust as a matter of course.

Indeed, how could we cope with the products of art if we were not able to change our mental set according to their media and conventions? You do not have to be an art historian to see that this simple embroidery (*Art and Illusion, pattern of drawn work 1568, fig.11*) is not meant to represent a world where plants and birds and children are black and have zig-zag contours, nor are we likely to be distressed on entering a museum (*Busts in the Capitoline Museum*) to see so many pale, cut-off hands, because we are familiar from childhood with busts.

It would be otiose to go on specifying such conventions which are inseparable from the media and genres of art to which we adjust so effortlessly. The question that has recently caught my attention is

rather whether the same also applies to those conventions we call style. Thus the rigid rules of the Egyptian style (King Mycerinus and Queen) might have looked quite natural to contemporaries who had come to expect them. But maybe when the Greeks surpassed these expectations (Apollo, Munich; Daphoros, Naples) the earlier conventions began to look natural, while the unaccustomed approximation to nature enhanced the impression of life.

I believe that such systematic efforts to surpass former expectations in the rendering of nature became so characteristic of Western art that it may be said that it was expected of every new generation. Indeed, when I wrote my book *The Story of Art* I implied so much. Here I might even show you a painting by Rembrandt (Niclaes Elvasz Pickevoy, Guild Portrait) (Rembrandt, Nightwatch (Amsterdam)), not one I discovered, to be sure, but one that strikingly surpassed the expectations of his Dutch fellow citizens who had been used to the institution of group portraits of militias like this one. Rembrandt's work in this genre was so much more lively that critics claimed that all the other group portraits looked like flat playing cards.

There is only one step, perhaps, though a decisive one, in this ambition of surpassing expectations to that of defying them (Picasso, Head of a Woman 1937 (Barcelona, Picasso Museum)) which will result in another kind of surprise which to me, at any rate, presents an intriguing conundrum: If, in the theory of information, the wholly expected can be equated with the redundant (W.Raum, Dispersion on Wrapping Paper), how are we to interpret a situation when it is always the unexpected we must expect?